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The THERAPEUTIC GAZETTE

INCORPORATING

MEDICINE AND THE MEDICAL AGE

A Monthly Journal of Practical Therapeutics

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MEDICINE AND THE MEDICAL AGE.

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ORIGINAL COMMUNICATIONS.

TREATMENT OF CHRONIC BRIGHT'S DISEASE.*

BY J. M. ANDERS, M.D., LL.D.,

Professor of Medicine in the Post-Graduate School of Medicine of the University of Pennsylvania.

There are two principal criteria which should serve to guide us in the treatment of chronic Bright's disease. They are the general condition of the patient as it is influenced by the progress of the affection, and the rate of metabolic excretion as determined by modern methods of examination. We should also pay due regard to the results of clinical and microscopical studies of the urine, although in my experience both albumin and tube casts have, at times, shown a tendency to increase under a judiciously restricted diet on the one hand, and to remain uninfluenced by a pretty generous diet on the other.

Without stopping to attempt to remove the touch of vigorous professional confidence in the percentage of albumin and the number and variety of tube casts as an index to the severity of the morbid process, and making it the foundation for prognosis and treatment, I feel that we have depended too exclusively on this somewhat uncertain standard in the past.

I propose considering the two criteria mentioned above for a moment separately so far as practicable, believing that most light may be thus thrown on the present-day means of dealing with this important disease.

The Rate of Metabolic Excretion.—This must be gauged by the most modern and approved methods. The amount of urea excreted in the twenty-four hours is an indication of the outcome of the case, and should be carefully and repeatedly estimated.

Among the substances excreted with great difficulty by a diseased kidney is creatinin. In this connection it is of great interest to note that Myers and Lough have shown that an estimation of the blood creatinin is of prognostic value—*e.g.*, over 5 mg. per 100 Cc. of blood having invariably terminated fatally in from a few days to two months, while figures from 3 to 3.5 mg. are to be regarded as decidedly unfavorable. It is essential, therefore, that substances which, like urea, creatinin, pigments, hippuric acid, and phosphates, are excreted with difficulty should be allowed in minimal amounts in Bright's disease. To avoid the ill effects of phosphoric acid, Von Noorden[1] recommends that calcium carbonate be added to substances containing it.

The test meal for renal function probably gives the earliest evidence of diminished kidney efficiency. Mosenthal and Lewis[2] hold phenolsulphonephthalein excretion and Ambard's coefficient are tests which enable one to follow most minutely the progress of renal disease.

The General Condition of the Patient During the Progress of the Disease.—While seeking to afford protection to the diseased kidney by extreme moderation in diet, especially in proteins, due attention is

*Read before the American Therapeutic Society at New York City, June 1, 1917.

to be paid to the matter of avoiding deleterious effects to all other organs—to the metabolism. The strength of the patient is to be preserved by adapting sound hygienic, therapeutic, and dietetic principles to the individual case.

Extremes of mental and bodily activity are to be avoided and the habits and mode of life of the patient regulated, the aim being to maintain the nutritive equilibrium, without producing irritation of the renal epithelium. All noxious substances entering into the etiology must be avoided and removed as far as possible. Primary foci of infection, *e.g.*, in the teeth and tonsils, should receive particular attention. By diminishing or removing such irritants as uric acid, alcohol, lead, and the like, the cardiovascular system is also conserved—a point of vital importance. The coöperation of the patient is always necessary to the end that the directions given shall be carried out persistently and faithfully.

The value of a change of residence to a warm, dry, and mild climate, in many cases of the chronic interstitial form of Bright's disease, is undoubted. The variability and humidity of temperate climates, particularly during winter, are aggravating factors in this disease, while a sea voyage or a sojourn at some resort where the soil is dry and sandy and the climate warm and equable may be highly beneficial.

Diet.—The chief control of chronic Bright's disease resulting from treatment is found in diet, coupled with the foregoing suggestions pertaining to the mode of life, rather than in drugs. The dietary restrictions should be both quantitative and qualitative. I quite agree with Shattuck[3] that a varied diet is more likely than a monotonous one to promote the making of good blood and improving the general nutrition, and that of the myocardium in particular.

An excess of protein, which is always harmful, can be avoided only by a close study of the functional capacity of the kidney at short intervals of time, and the repeated estimation of the urea and creatinin content of the circulating blood. By pursuing such a course it is found that ofttimes greater latitude may be extended without injury to the sick kidney, and thus aid decidedly the general metabolism. In this connection the view of Foster and Davis,[4] to the effect that in cases in which there is no great amount of edema we must allow considerable water, the while we diminish the protein intake, in order to eliminate the solids and retained nitrogen, is sound and to be adopted.

On the other hand, when dropsy of a more marked degree is present, the fluid intake should be restricted to a total daily amount not exceeding one liter. In this class of cases, composed largely of instances of chronic parenchymatous nephritis, a salt-free, or what is more practicable, a salt-poor, dietary is a most useful adjuvant to efforts at removing the edema.

Whilst whole milk should make up a considerable portion of the diet, Von Noorden has pointed out that milk contains on the whole too much protein, and recommends that it should be restricted to three pints a day, to which a pint of cream should be added. The writer has found skim-milk and buttermilk, in appropriate quantities, of signal value in cases in which dropsy is marked.

Recently, Terwaert and Van Lier[5] have put forth the claim, based on their experiments and clinical experience, that restriction to a milk diet in cases of nephritis with retention of urea is decidedly harmful.

In general a mixed diet will be of advantage: proteins in quite limited amounts,* greens, fruits (especially fruit juices), pure fats, and light, well-cooked farinaceous dishes and cereals (except oatmeal) may be allowed. Cocoa may be used as a beverage at the morning meal. The effect of a given restricted dietary is to be noted by making careful observation of the bodily weight and of repeated tests of the functional capacity of the diseased kidney, as well as of the urine and the urea and creatinin content of the blood.

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*While from 80 to 100 gm. of nitrogen daily are required, it is often advisable to allow much less, even as small an amount as 5 gm. for a week or two.

In the writer's view it is no less important to the welfare of the sufferer from chronic Bright's disease that the metabolic processes be watched than to protect by an appropriate diet the chronically "sick kidney" with a view to maintaining, as far as possible, its functional equilibrium.

Drugs.—Drugs, while not curative, may counteract certain dangerous tendencies resulting from interference with kidney excretion. In the exudative variety, in which anemia is often pronounced and progressive, a chalybeate course from time to time is useful. In this form anasarca is also present and calls for treatment. The patient should be put to bed, where he should remain until the circulatory equilibrium is restored, while at the same time cholagogues, diuretics, and diaphoretics should be given.

Saline cathartics, exhibited after the Matthew Hay method—*e.g.*, in concentrated solution in the early morning so as to produce two or three watery discharges daily—are useful. Mercury, in all of its forms, is to be omitted, since it has been shown that this drug has a selective affinity for the kidney and is, therefore, harmful in its effects in Bright's disease. Unfortunately, the custom of prescribing a mercurial preparation at intervals in this complaint, especially when edema is present, is only too common, but it should not be approved by the medical profession.

Again, one of the main aims of treatment is to spare the renal epithelium irritating substances, hence such diuretics as caffeine, theocin, sodium acetate, and other members of the purin group should be abandoned in the therapeutics of this disease. On the other hand, we may employ for their diuretic effects unirritating substances, as digitalis, and the salts of potassium, especially the citrates, either singly or in combination.

Active diaphoresis, especially if induced by means of hot-water baths, or hot, wet, or dry packs, is a potent factor in lessening dropsical transudates and the albuminuria, if persistently carried forward at intervals of twelve or twenty-four hours.

In cases in which the renal lesions have not reached an advanced stage, the writer has observed excellent results from a course of the hot Nauheim baths, which markedly enhance elimination through the skin and kidneys.

The Karell diet or the Karell cure is warmly advocated by Goodman[6] and others. The technique is simple: "The patient receives daily at 8 and 12 A.M., and at 4 and 8 P.M., 200 Cc. of raw or boiled milk, warm or cold, according to taste." If great complaint is made, because of thirst, the patient may be allowed to rinse out his mouth with water, with instructions, however, that none be swallowed. It is customary to continue this strict diet in cases of renal edema for a period of one week, after which it may be gradually relaxed.

No aspect of the therapeutics of Bright's disease has engaged the attention of the profession to so great a degree as that of the associated hypertension. The lesson has not been learned as yet, when active interference with this ofttimes compensatory mechanism should be commenced. It is to be recollected that while high systolic and diastolic blood-pressure is a constant symptom of chronic interstitial nephritis, if we except the arteriosclerotic kidney of the aged, the inflammatory parenchymatous form, so long as it is compensated, exhibits no increase of blood-pressure.

Says Engel,[7] the theory that ascribes nephritic hypertension to the chronic parenchymatous variety of renal diseases rests upon confounding it with cardiac hypertension. In approaching the question of the management of the hypertension, it is well to keep in remembrance that in the renal type of hypertension, including evidences of damage to the vascular system, an unfavorable prognosis appears to depend, as pointed out by Stone, upon the height of the diastolic pressure, to which rather than to the systolic our closest attention should be given, since it should form a guide to aid our efforts to reduce high tension. In view of the presence of a greatly increased diastolic pressure, myo-

cardial exhaustion supervenes, resulting in decreased urinary output, and symptoms due to increased retention of urea, leading in some cases at least to a fatal termination.

On the other hand, cerebral deaths, due to the greatly augmented diastolic pressure, are more common than myocardial deaths. It follows as a natural corollary that by a reduction of the high diastolic pressure we not only relieve such features as headache, vertigo, and so-called renal asthma, but also and more importantly, rupture of the cerebral arteries—an accident that often terminates life abruptly. This indication is to be met by the cautious use of nitroglycerin in ascending doses, beginning with 1 minim every three hours. In this manner we also relieve the heart of a serious strain, which is the result of a greatly increased tension and may lead to myocardial exhaustion.

My experience of the use of hot baths, in selected cases, accords with that of Rowntree,[8] who states that a drop of 10 to 20 mm. often persists some time after a hot bath that results in a good sweat.

While affording therapeutic assistance to meet high tension, the effects upon the heart, the urinary output, and the urea and creatinin content of the blood must be noted. A too great reduction of the arterial tension, a prevalent mistake, is undesirable, being attended with danger of uremia and serous transudates owing to insufficient urinary excretion.

Myocardial exhaustion, which manifests itself in the terminal stage of cirrhotic kidney, with signs of cardiac dilatation, scanty albuminous urine and anasarca, requires heart tonics and stimulants. Here digitalis has good effects; it improves the myocardial tonus and often decidedly increases the urinary output, both as to fluids and solids, for a season at least. With the digitalis a small dose of nitroglycerin may be combined if the peripheral tension be high.

If, despite the treatment described above, definite uremic manifestations, more particularly vomiting, muscular twitching, convulsions, or coma supervene, vigorous measures are to be resorted to with all possible expedition. Starvation for two or three days is advisable. Prompt venesection followed by the use of normal salt solution given subcutaneously, 500 to 1000 Cc., as recommended by Herrick,[9] often gives much temporary relief.

The writer has observed good effects from the subsequent employment of the Murphy drop method of administering this solution, preceded by colonic flushing. Free catharsis and active diaphoresis must be secured in the manner above described.

Inhalation of chloroform, or what is often a useful and, the writer believes, an essential measure, the hypodermic injection of morphine, is to be employed, in doses of from gr. 1/6 to 1/4, and repeated according to the indications of the particular case. White and Wilcox[10] have shown that morphine does good in Bright's disease, by diminishing the oxidizing functions of the body metabolism. The late Dr. LeFevre lauded chloral, and the writer has observed gratifying results from its use in half-drachm dosage thrown into the rectum at intervals as required.

Time and space do not permit of a full presentation of the treatment of all complicating conditions and symptoms in chronic Bright's disease, but those omitted from consideration here must receive attention in accordance with accepted therapeutic principles.

Kidney Organotherapy.—This method of treatment has recently received considerable attention, but it has not had vogue long enough to permit of a proper appreciation of its value. Sajous[11] claims that favorable results have been reported in about one-half of the cases of chronic nephritis in which kidney preparations have been tried. One may use a maceration as have Page and Dardelin,[12] or more conveniently a tablet known as nephritin, prepared in this country by Reid and Carnrick. The dose of the latter is ten to fifteen 5-grain tablets daily, preferably given between meals. Kidney preparations produce several effects, of which the chief are three: (*a*) The prevention of uremia; (*b*) a reduction in the percentage of albu-

min; and (*c*) increased diuresis. It is not improbable that nephritin and other kidney preparations owe their stimulating effect upon the urinary output and their antitoxic power to an adrenal principle in organic combination.

Salvarsan has yielded encouraging results in cases of syphilitic origin. Perhaps the only prerequisite to a fair degree of success in the use of salvarsan or neosalvarsan is the selection of cases in the earlier stages of this form of nephritis, since no drug "can possibly restore destroyed renal parenchyma or transform fibrous connective tissue into secreting kidney cells."[13]

Surgical Treatment. — The percentage of cases in which surgery—*i.e.*, incision of the capsule or cleavage of the cortex—serves a useful purpose is probably small, and it is gratifying to note that the ardent advocates of these operative procedures are far less numerous than they were a single decade ago. It is conceivable that a splitting of the capsule or mere puncture of the same will diminish normal tension and thus relieve pain which may be present. Moreover, for hematuria, or particularly if practically limited to one side, "the operation should be recommended, as it has been frequently followed by cessation of the hemorrhage in chronic Bright's disease" (Newman[14]).

As a rule, the good effects of operation are only temporary, the result of an improved circulation which, however, cannot be long maintained. Surgical methods cannot modify the nature and progressive character of a chronic nephritis, cannot arrest nor even appreciably retard the renal and arterial fibrosis and their mechanical consequences. Finally, no form of treatment is, in a real sense of the word, curative that has not for its main aim an amelioration of the toxemic condition present and the removal of etiological factors in particular cases.

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PRELIMINARY REPORT REGARDING MINERAL OIL AS A VEHICLE.

BY JULIUS H. HOELSCHER, M.D., CHICAGO, ILLINOIS.

Mineral oil has the well-known property of passing through the intestinal tract unchanged. In addition it is not absorbed into the general circulation. These properties suggested that the oil might be utilized as a vehicle for medicinal substances such as iodine, chenopodium, scarlet red, bismuth salts, beta-naphthol, thymol, magnesia compounds, etc.; assuming these, like the oil, might not be absorbed and therefore open the way to obtain what has been so much sought after, namely, intestinal antisepsis or disinfection. The first substance tried by the writer was iodine in its metallic state. The resultant mixture assumes a violet color and the iodine apparently is thoroughly fixed by the oil. The solution represented one grain of iodine to two ounces of the oil, and was given in half-ounce doses once or twice daily. The relative effect of the oil remains the same. The taste is slightly pungent, and this pungency may be overcome by drinking a glass of cold water with each dose.

The following cases were treated with iodinated oil. It is admittedly true that the

profession often is called upon to treat and diagnose cases of gastrointestinal disturbances that suggest the existence of ulcers and other chronic or acute lesions, but wherein no definite indications of ulcer, etc., are found.

For lack of more descriptive terms we are compelled to adopt the words gastrointestinal putrefaction, autointoxication, etc.

The urine offers much in connection with kidney lesions, but the feces are still far removed from offering convincing evidence of intestinal disturbances that are directly indicative of so-called autointoxications and putrefactions. A lifetime could easily be devoted to solving the microbic and chemical phases of feces and at the end leave much unsolved.

Mrs. D., aged fifty-three. Menopause eleven years ago. Had diphtheria three times, and for the last attack, which occurred five years ago, used antitoxin. Had brachial neuralgia six years ago, for which baths were used with apparently good results. No children and no miscarriages.

Present illness: Two years ago became aware of stomach disturbance; she would have two or three semiliquid bowel evacuations in quick succession, preceded by slight abdominal distress and pain. Had an operation for hemorrhoids three years ago. Gastric distress, such as uncomfortable localized pain, transient nausea, rarely vomiting, and pronounced gaseous distention occurred directly after meals and continued for three or four hours. The vomitus usually consisted of food remnants and an acrid sour fluid. Vomiting always brought relief. Refused at all times to diet, and shunned medical treatment on that account. Intestines are constantly distended with gas. Complains of a well-localized epigastric pain which is most noticeable at night and sometimes severe enough to cause sleeplessness. It does not appear to be a hunger pain, and there is no apparent connection between the taking of food and the pain.

Examination: No findings other than the following: Occasional cardiac extrasystole, no valvular lesion or cardiac enlargement. Left kidney floating. Tenderness in epigastrium of moderate severity, but no tumor or abnormal formation. Topography of the abdominal organs normal. *X*-ray reveals gastric hypertonicity, spastic pylorus, no obstruction.

Intestinal tract revealed no abnormal conditions. Feces showed mucus intimately mixed with bowel contents; no blood, microscopic, occult, or macroscopic. There were present a large variety of Gram-negative and Gram-positive microbes, with no special type predominant.

The patient refused to diet and preferred her distress plus her social life and obligations to restricted diet and changed mode of life. The only medication prescribed was the iodinated oil in half-ounce doses at bedtime, and if no relief followed another dose was to be taken at 10 A.M.

Over a year has elapsed and the patient reports occasionally, and claims to have secured relief. She is taking the oil every night, at bedtime.

Mr. M., actively employed in a lumber camp and on a farm. History was negative regarding lesions that might have a bearing directly or remotely on the present illness. An analysis of the dietetic phases indicates that he eats excessively of potatoes, butter, and bread. He noticed gradually increasing gas formations in the abdomen; no pain in the abdomen, no nausea, no vomiting, and undisturbed appetite. He claimed that he had a daily bowel evacuation, but the history suggested that this evacuation was not sufficient as considered in connection with the food intake.

During the gas distention he had slight nausea, transient vertigo, tired easily, and lacked ambition. Sleep was undisturbed by pain at night. Finally the distention became so pronounced that severe pains appeared in the cardiac region and assumed an anginal character, causing the attendant to suspect angina pectoris. Several times syncope supervened. He never had used tobacco and alcoholic drinks, but drank to excess of coffee.

The examination was negative as applied

to blood findings, urine, cardiovascular organs, nervous system, respiratory and genito-urinary organs. The nasopharynx and mouth were negative. *X*-ray revealed large gas accumulations in the stomach and splenic flexure of the colon. Delayed intestinal motility; no ulcer of the stomach or duodenum; no evidences of adhesions, malpositions, or tumors. There was no well-defined reason for suspecting either the appendix or the gall-bladder.

The stomach was moderately dilated and hyperacid. The feces generated gas to excess, but free from blood, pus, parasites, and ova. They contained some mucus and fatty acids. The microbes of the Gram-positive type predominated. The capsulated aerogenic gas organism was present.

The treatment consisted of selected diet and two doses daily of the iodinated oil—one at 10 A.M. and the other at bedtime.

Relief was prompt and has continued to the present time. This case has been under observation since last October.

Male, aged forty-seven. At fourteen years of age had articular rheumatism. At eighteen years of age had recurrent headaches that resembled migraine. Up to four or five years ago had recurrent tonsillar infections. In 1903 had an operation for mastoiditis, which healed in three months. Absolutely no history of syphilitic infection. Several years ago developed a mild tabes, for which he received mercurials and iodides. The disease was so mild that he was enabled to follow his commercial occupation without attracting the attention of others to the tabes. He particularly complained of the following gastrointestinal symptoms: About one hour after eating gases formed in the stomach and intestine and remained for three or four hours—often until the next meal. With the distention some pain and discomfort, and he assumed that the gastrointestinal disturbance caused periods of decided vertigo of short duration but quite annoying.

Purgatives brought relief, as constipation was a constant symptom. He had a normal appetite and used alcohol moderately. He particularly favored potatoes and butter in the selection of food.

At this point note the fact that many of the intestinal putrefactions are determined apparently by excessive eating of potatoes, bread and butter, and faulty carbohydrate food combinations. Much might be written regarding the great importance of so arranging diets that the ration is well balanced. This much-neglected phase deserves attention, with particular reference to gastrointestinal disturbances.

Physical examination: Positive findings of tabes. No organic lesions discoverable. Blood findings negative. *X*-ray revealed normal topography and lessened motility. No pathognomonic signs of gastric and duodenal ulcer. Urine contained an excess of indican.

Feces: Gas content excessive; mucus intimately mixed with feces, undigested food remnants, no occult blood, no ova, and no parasites; fatty acids abundant. Gram-positive microörganisms largely increased; there were present rod-like forms large and small, capsulated forms, and few streptococcic types.

In this case the progress was slow but constant. He has been under observation about seven months, and now is free from distress. He took the iodinated oil at bedtime and followed the prescribed diet.

SUMMARY.

First. The iodine is not absorbed into the general circulation because all the known tests that were made to detect it in the urine failed to disclose its presence. This applies to those who had taken the mixture a few days and those who had taken it over six months.

Second. The iodine can be detected in the feces, in all cases—more so in those who had taken it for months.

Third. No indications of iodism or toxic effects appeared in any case.

Fourth. The maximum dose that can be safely given is open to investigation.

Fifth. The laxative effect of the oil is not modified by the addition of iodine.

Sixth. The indications for its use are to be found in intestinal autointoxications or intestinal putrefactions. These terms are used for lack of better descriptive words.

The writer's experience justifies the conclusions that the oil gives better results with the iodine than without—because observations made regarding the Gram-negative and Gram-positive microbic findings revealed a marked difference before and after taking—and the symptoms of autointoxication were favorably influenced. In gastric and duodenal ulcer the effects were often quite pronounced regarding the pain, hyperacidity, gaseous distention, and distress occasioned by food.

Particularly impressive is the possibility of overcoming hookworm and other intestinal parasites when the oil is combined with chenopodium, iodine, oil of turpentine, guaiacol, thymol, pelletierine, etc., and since the oil is not absorbed one may assume that these rather toxic agents may also pass through the gastrointestinal tract unchanged. This, however, calls for considerable investigation.

Combined with bismuth subcarbonate it proved successful in a case of recurrent mucous colitis; it disposed of the constipating effect of the bismuth and quickly brought normal bowel and fecal changes.

25 E. Washington Street.

THE MECHANISM OF CARBOHYDRATE METABOLISM.[1]

BY ALBERT P. BRUBAKER, M.D.,
Professor of Physiology in the Jefferson Medical College of Philadelphia.

Among the interesting problems that confront the physician from time to time is the successful treatment of a group of symptoms the chief of which is the appearance of sugar in the urine. The difficulty of successful treatment lies partly in the fact that the mechanism by which carbohydrate material is temporarily stored, subsequently released, and finally oxidized, is but imperfectly known; and partly in the further fact that the pathologic factors that disturb the normal action of this mechanism are not in some instances readily determinable, and even when determinable their modes of action are not always apparent.

The object of this paper is to present in as simple terms as possible some of the established facts regarding the mechanism by which sugar is stored, released, and finally oxidized. These problems, embraced under the term, metabolism of the carbohydrates, are of prime interest by reason of the fact that they are intimately related to that grave condition of persistent glycosuria seen in man to which, in connection with other symptoms, the term diabetes has been given.

The Storage of Sugar.—At the outset the fact must be accepted that the carbohydrates are consumed almost exclusively for the production of heat and the performance of work. This fact has been established by a long series of experiments carried out by physiologists and chemists.

Since the muscles are the organs chiefly concerned in the production of heat as well as in the performance of work, it is a plausible assumption that the storage of sugar as well as its oxidation is to be sought for in the muscles themselves. As a point of departure it may be assumed that the tissues have been depleted of all carbohydrate material, and that on a given day the usual quantity, from 300 to 400 grammes (10 to 12 ounces), is consumed, digested, and converted, in the small intestine, for the most part into a form of sugar, termed glycose, glucose, or dextrose, the chemic formula for which is $C_6H_{12}O_6$. Under this form[2] the carbohydrate material

[1] Paper read before the Philadelphia Clinical Association, May 15, 1917.

[2] Other sugars, such as levulose and galactose, formed to some extent during digestion, are left out of consideration. They probably undergo after absorption the same transformation that glucose does.

is absorbed by the epithelial cells covering the villi, and by them transmitted to the blood in their contained capillary blood-vessels. It is then transported by the blood stream, by way of the portal vein, to the liver. That this is the case is shown by the results of chemic analysis. Thus the blood obtained from the portal vein after the ingestion of a meal rich in sugar, shows a higher percentage of sugar than the blood obtained from any other portion of the circulatory apparatus.

On reaching the liver a large percentage of the sugar will in the course of the day be carried onward into the blood of the general circulation, and in a short time be delivered to the capillaries of the muscle tissues. On reaching this situation, the sugar being a highly diffusible substance will pass across the capillary wall into the surrounding lymph spaces, thence across the sarcolemma into the interior of the muscle cell, where it comes into direct contact with the cell material. Here through the action of an intracellular enzyme, the sugar is deprived of a molecule of water and is thereby transformed into a non-diffusible substance which resembles in its chemic relations vegetable starch. Under this form the carbohydrate material in part is retained until the necessity arises for its oxidation.

Inasmuch as this starch is subsequently again transformed by the addition of a molecule of water into sugar (glucose) before oxidation can take place, it has been termed glycogen, a generator of sugar. For this reason the muscle may be said to have a starch-forming or a *glycogenic* function, and a sugar-forming or a *glycogenetic* function. Chemic analysis has shown that muscles contain normally from 0.5 to 1.0 per cent of glycogen, and as these organs constitute about 40 per cent (28 kilogrammes) of the body weight (70 kilogrammes), they collectively generally contain from 140 to 280 grammes (6 to 10 ounces) of glycogen. As chemic analysis has failed to detect the presence of glycogen in the blood the inference is that it arises in the muscle cell itself in the manner already indicated. From these facts it is apparent that the muscles are organs in which carbohydrate material is stored in very considerable quantity, hence it is readily accessible when the need for energy is pressing.

Coincidentally with the storage of sugar in the muscles a certain portion (10 to 20 per cent) of the sugar absorbed from the intestine is stored in the liver. As the blood flows through the capillaries of the liver, some of the sugar passes across the capillary wall into the surrounding lymph spaces, where it comes into direct contact with the liver cells. Here also, through the agency of an intracellular enzyme, the sugar is dehydrated (deprived of a molecule of water), converted into starch, and stored in the liver cells, where it presents itself in the form of hyaline masses which can be readily seen with the aid of the microscope.

Inasmuch as this starch is subsequently transformed into sugar (glucose) it, too, has been termed glycogen. For this reason the liver may be said to possess a glycogen-forming or a *glycogenic* function. Chemic analysis has shown that the liver contains from 1.5 to 4 per cent of its entire weight of glycogen, and as this organ weighs on an average about 1600 grammes it contains from 24 to 64 grammes of glycogen. On a diet rich in carbohydrates the glycogen may be increased to 10 per cent. The liver glycogen thus represents an excess of carbohydrate material not immediately needed for oxidation purposes.

The blood plasma also contains a portion of the absorbed sugar under the form of glucose, and is to be regarded as a normal constituent. The quantity present varies from 0.10 to 0.15 per cent. To this condition of the blood the term *glycemia* has been given. If the statement be accepted that the amount of blood in a body weighing 70 kilos is 3864 grammes (one-nineteenth of the body weight), the amount of sugar in the entire volume is at most about 5.8 grammes.

Though the muscles and the liver are the main organs concerned in the storage

of sugar, it is highly probable that many other organs are engaged in the same process, especially those in which growth and nutrition are active.

The storage or the assimilation of sugar is influenced to some extent by the activity of the posterior lobe of the pituitary body. Thus it has been shown by Cushing that mechanical and electric stimulation of the posterior lobe is followed by glycosuria, the amount of sugar excreted depending on the amount of glycogen in the liver. This is attributed to a discharge, in amounts greater than normal, of its internal secretion into the cerebrospinal fluid and subsequently into the blood. The effect of the excess of the secretion is to lower the normal assimilating power or capacity, and hence leads to an insufficient oxidation and elimination. If the stalk of the posterior lobe be clamped so as to prevent the discharge of the secretion the assimilation capacity rises. As a result a condition of nutrition is established, characterized by a general deposition of fat, suggesting a conversion of the sugar into fat. The assimilation of sugar is apparently regulated by the posterior lobe of the pituitary, since it is lowered by a hypersecretion and raised by a hyposecretion. The manner in which this is brought about is, however, unknown.

The assimilation of sugar is apparently influenced in a similar manner by the parathyroids. Thus when three of the four bodies are removed the tolerance for sugar is diminished, as shown by the appearance of glycosuria. The thyroids appear to be without influence in this relation.

The Release of Sugar.—The necessity for a release of carbohydrate material from the storage tissues, and more especially from the liver, arises from the fact that the circulating sugar which readily passes into the muscle tissues is promptly oxidized, and hence the sugar content of the blood rapidly falls below the normal and a condition of *hypoglycemia* is temporarily established. With the establishment of this condition the liver cells transform a portion of the glycogen into glucose by the addition of a molecule of water, and as the sugar is highly diffusible, it passes across the wall of the capillary vessel into the blood and thus restores the sugar content and brings it up to normal. This procedure continues until the necessity arises for the consumption of a new supply of food materials. From the foregoing fact the liver is said to possess a sugar-forming or a *glycogenetic* function. To this transformation of glycogen into sugar the term *glycogenolysis* has recently been applied.

The question now arises, by what agency or mechanism are the liver cells stimulated to release the glycogen and transform it into sugar and discharge it into the blood in amounts just sufficient to replace the sugar oxidized, without giving rise to hyperglycemia and glycosuria?

That this process is to a considerable extent regulated by the nerve system is apparent from the effects that follow certain lesions of the nerve system, whether established by pathologic processes, experimental procedures, or psychic states such as major emotions, prolonged anxiety, etc.; but whether the regulation is *direct* (*i.e.*, through its action on the liver cells) or *indirect* (*i.e.*, through its action on glands of internal secretion)—*e.g.*, adrenals and hypophysis—is a subject of discussion and experimentation.

It is a well-known fact that if the floor of the fourth ventricle is punctured at a point between the origin of the acoustic and vagus nerves, near the middle line, a glycosuria will be established in from one to two hours, and which will last from five to six hours in the rabbit, and from three to seven hours in the dog. Coincidentally there is an increased amount of sugar in the blood (hyperglycemia) and a higher percentage of sugar in the liver than is normally the case. Apparently the initial step in this series of phenomena is an increased conversion of glycogen into glucose, increased glycogenolysis. This supposition receives confirmation from the fact that the degree of the hyperglycemia and glycosuria is determined by the amount of glycogen previously present in the liver. If the percentage of glycogen is high, the resulting

glycosuria is pronounced; if the percentage is low, as it will be after a fast of several days' duration, the glycosuria will be slight or entirely wanting. The foregoing fact, together with other facts derived from the fields of pathology and clinical medicine, has led to the view that there is in the medulla oblongata a group of cells which through efferent fibers influence the production of sugar in the liver. From the further fact that the glycosuria is but temporary in character the inference is that the puncture stimulates rather than destroys these cells. This view is corroborated by the fact that a similar glycosuria is established by psychic states of an emotional character—*e.g.*, fear, and injuries to sensory nerves in different regions of the body. In either case the nerve impulses so developed in the cerebrum or in the periphery are transmitted to the group of cells in the medulla, which are then stimulated to increased activity.

The efferent pathway for the transmission of the nerve impulses is down the cord, thence through the splanchnic nerves to the semilunar ganglion, and thence by way of the hepatic plexus to the liver. That this is the pathway is shown by the fact that if either the spinal cord is divided above the level of the splanchnic nerves or the splanchnic nerves themselves are divided, puncture of the medulla does not give rise to glycosuria. On the contrary, stimulation of the splanchnic nerve, more especially on the left side, gives rise to glycosuria.

Since it has been shown in recent years that the injection of a certain percentage of adrenalin into the body is followed by a glycosuria, the question has arisen as to whether the nerve impulses developed by stimulation of the medulla or the splanchnic nerves pass (1) by way of the semilunar ganglion and its post-ganglionic fibers direct to the liver cells, thus exciting them to increased activity; or (2) by way of post-ganglionic fibers direct to the adrenals, exciting them to discharge a larger amount of adrenalin into the blood; or (3) by way of both systems of nerves. The following facts will serve to elucidate this problem: The subcutaneous injection of one milligramme of adrenalin chloride per 1000 grammes of body weight will give rise to hyperglycemia and glycosuria. Stimulation of the left splanchnic nerve just where it sends branches to the adrenal gland gives rise to an increased secretion and its discharge into the blood, as can be shown in many ways. From these facts the deduction is made that the hyperglycemia and glycosuria are the result of an increase in the normal percentage of adrenalin in the blood, and this latter fact is due to splanchnic stimulation. This supposition is strengthened by the further fact that after removal of the adrenal glands, neither puncture of the medulla nor stimulation of the splanchnic nerve gives rise to glycosuria except in rare instances.

It is not to be inferred, however, that the mere presence of adrenalin in the blood is the cause of the increased activity of the liver cells, and hence of the hyperglycemia and glycosuria, for if the hepatic plexus is completely divided, thus preventing nerve impulses from reaching the liver, the increased percentage of adrenalin in the blood fails to produce glycosuria.

That another factor is present is apparent from the following: Stimulation of the hepatic plexus always gives rise to glycosuria when the adrenal glands are intact, but never after their removal. Hence the assumption may be made that the production of sugar by the liver is under the control of the central nerve system and by the route detailed in foregoing paragraphs, but only when a sufficient amount of adrenalin is present in the blood. The rôle assigned to the adrenalin is a heightening of the irritability of the terminals of the hepatic plexus, whereby arriving nerve impulses become more efficient in their action.

The strictly physiologic factors that maintain and regulate the activity of the cells in the medulla, and which in turn cause by way of the splanchnics a discharge of sugar from the liver, and in amounts just sufficient to replace the sugar oxidized, are but imperfectly known. Whether they are to be found in variations in the com-

position of the blood or in the play of nerve impulses transmitted from special regions of the body cannot with any degree of definiteness be stated.

The glycogen of the muscles is released and converted by intracellular enzymes into glucose during muscle activity, whereupon it undergoes oxidation and contributes to the production of heat and supplies energy for muscle work. During rest it reaccumulates by the conversion of glucose arriving in the blood stream, and which has been released by the liver.

The Oxidation of Sugar.—As previously stated the final stage in the metabolism of sugar is its oxidation to carbon dioxide and water with the liberation of its contained energy, largely in the form of heat. This is accomplished in the tissues generally, but to the greatest extent by far in the muscle tissue. The intermediate stages are, however, but imperfectly known, though the first stage is believed to be lactic acid. The successive oxidations due to the presence of enzymes in the muscle tissue are embraced under the term *glycolysis*. The glycolytic enzymes, however, appear to be incapable in themselves to initiate the changes. For if glucose is added to an expressed juice of muscle tissue and the mixture is kept at a suitable temperature, oxidation does not take place, but if an expressed juice of pancreas be added to the muscle tissue juice, oxidation of sugar is promptly brought about. From experiments of this character it has been assumed that the muscle enzymes are inactive and require the presence and activating influence of a specific material secreted and discharged into the blood by the pancreas, a material partaking of the nature of a hormone. This view is based partly on the effects which follow extirpation of the pancreas. When the animal survives this operation a glycosuria is soon established, followed by a series of symptoms resembling those observed in diabetes mellitus. If a portion of the pancreas be transplanted into the subcutaneous tissue and time be allowed for it to establish vascular connections, then the removal of the pancreas will not be followed by a glycosuria.

It would appear that in the absence of the pancreatic hormone, the sugar discharged by the liver into the blood and transmitted to the muscles cannot undergo oxidation, and hence accumulates, giving rise to hyperglycemia and glycosuria. The influence of the pancreas in this respect has been demonstrated by Knowlton and Starling. These investigators were able, by employing a heart-lung preparation of a normal dog, to keep the heart beating for several hours in a practically normal manner by causing the blood of the same animal to circulate through its own cavities and coronary system at the rate of about 300 Cc. every two minutes. To this blood glucose was added. At the end of the experiment of about an hour's duration, it was found that the amount of sugar oxidized was on the average 4 milligrammes per gramme of heart muscle. On substituting the heart-lung preparation of a dog that had been rendered diabetic by the removal of the pancreas, it was found that the power of consuming sugar was reduced to a minimum or altogether lost by reason presumably of the absence of the necessary hormone. They then demonstrated that the heart of the diabetic animal acquired a sugar-consuming or oxidizing power on feeding it with the blood of a normal animal, the consumption being in one animal 2.9, 5.8, 8.1 milligrammes per gramme of heart muscle in three consecutive hours. The deduction from these and other experiments is that the oxidation of the sugar is dependent on the presence in the muscle of a specific hormone or activating agent secreted by the pancreas.

From the foregoing facts it is apparent that the mechanism by which sugar is stored, released, and finally oxidized is not only very complex, but also delicately adjusted. An impairment in the activity of almost any part of the mechanism may lead to a more or less serious disturbance of sugar metabolism, and be followed by a glycosuria more or less pronounced and

prolonged. Among the causes of the glycosuria may be mentioned the following:

1. An incomplete abstraction of sugar from the portal blood and its storage as glycogen in the liver cells. This may be due to an impairment in the functional activities of the liver cells or to the ingestion and absorption of sugar in amounts beyond the normal assimilation limit, or to a lowered assimilation limit by reason of a hypersecretion of the posterior lobe of the pituitary.

2. A too rapid release or conversion of glycogen to sugar on the part of the liver cells. This may result from an increased activity of the cells in the medulla, due to the arrival of nerve impulses from (*a*) the cerebrum as a concomitant of psychic states of an emotional character, such as fear, profound anxiety, etc., or (*b*) from other regions of the body due to serious injuries. Simultaneously there may be a hypersecretion of adrenalin.

3. An incomplete oxidation of sugar in the muscles leading as a result to a hyperglycemia. This may be the result of the absence of the necessary pancreatic hormone as a consequence of destructive organic disease, or perhaps an insufficiency in its production.

THE TREATMENT OF GAS POISONING.

HENDERSON and PAUL have studied these matters carefully and their results are given in Technical Paper 82 of the Department of the Interior. They emphasize how important it is to carry a man overcome by carbon monoxide into fresh air and remove his apparatus as soon as possible. For fifteen to twenty minutes thereafter it is beneficial to administer pure oxygen, or air considerably enriched with oxygen, by means of a tank, bag, and mask with valves that do not allow rebreathing. If the victim, though unconscious, is breathing in nearly the normal manner, he may be allowed to inspire the oxygen himself. If the breathing is slow and irregular, or has stopped entirely, as may be the case in sudden exposure to concentrated carbon monoxide, artificial respiration by the Schaefer method, but with administration of oxygen, should be performed. The stronger the oxygen the sooner the carbon monoxide is displaced and the oxygen-carrying capacity of the hemoglobin restored. Even when only pure air is breathed the mass action of its oxygen is usually sufficient to displace the greater part of the carbon monoxide in an hour or even only half an hour, so that the oxygen-carrying power of the hemoglobin is restored sufficiently to meet the patient's needs. Practically all of the carbon monoxide is eliminated and the hemoglobin fully restored in three or four hours. This is facilitated by the rapid breathing, usually 30 to 45 times per minute, which such cases exhibit during recovery, and which is probably caused by incomplete combustion products formed in the tissues during the asphyxia and circulating in the blood for some hours thereafter, or by some long-lasting effect on the respiratory center.

In many instances the victim never recovers consciousness and dies a day or two later. Many physicians still hold to the belief (now completely disproved) that the prolonged coma is due to retention of the carbon monoxide, and advocate bleeding, infusion of oxygenated saline solution, transfusion of blood from some healthy person, and other active efforts at restoration. None of these procedures nor any known procedure aside from careful nursing and symptomatic treatment has been demonstrated in practice to be of any benefit. Recovery when it occurs is not due to them, but in spite of them. There is indeed no reason to expect them to be beneficial, for it is not retention of carbon monoxide but the results of the injury to the brain and other organs, caused by lack of oxygen supplied by the blood while the patient was breathing the gas, which is responsible for the prolonged coma and subsequent death or incomplete recovery. There is no known method of restoring tissues to normality after parenchymatous degenerations have once been initiated. Left to itself nature does all that can be

done to stop the abnormal processes. The man recovers completely if the asphyxia has not been too intense and prolonged, although in many cases men who have once been "gassed" exhibit a muscular weakness of the heart permanently thereafter. More severe cases recover only with the loss, partial or complete, of vision, power of speech, or with some other nervous defect.

The foregoing statements regarding the effects of carbon monoxide upon men are based principally upon the work of Dr. Haldane. The experience of the authors has confirmed them in every detail. Thus one of the authors has repeatedly in experimental work breathed air containing carbon monoxide until his blood was 20 per cent saturated. No vigorous exertion was made and no ill effects were experienced. Within two or three hours practically all of the carbon monoxide had been eliminated and he was as fit for vigorous exertion as before. This of course would not have been the case if any lasting deterioration in the hemoglobin of the blood had been produced. Furthermore, one of the authors has repeatedly examined the blood of persons overcome by illuminating gas in accidents at New Haven, Conn. In six successive cases in which a sample of blood was taken and examined not more than two hours after the patient had been removed to fresh air from the room in which asphyxia had occurred, the elimination of carbon monoxide was found to have been so rapid that in only a single case was the presence of a small amount in the blood still demonstrable. In all of these cases the blood had undoubtedly been saturated beyond the danger point of 60 per cent, yet two hours in fresh air had served to reduce the carbon monoxide to less than 15 per cent, the amount which the small pocket spectroscope employed was capable of distinguishing. Four of these cases died within 24 to 60 hours after the asphyxiation. One was a case in which a small percentage of carbon monoxide was detected two hours after removal to fresh air, but recovered completely. Another still exhibited profound nervous impairment a month later.

These observations are sufficient to demonstrate the unwisdom of bleeding patients who have been poisoned with carbon monoxide, in order to stimulate the formation of new red blood cells. Such a formation requires several days to become fully effective. In the majority of cases the patient's blood is practically free from carbon monoxide before the bleeding is performed. Cases of carbon-monoxide poisoning exhibit such wide variations in the severeness of the initial symptoms, in the length of time required for recovery, and in the completeness of restoration, that it is difficult to establish conclusions regarding them from merely clinical or statistical evidence. Theoretically there is no treatment that would seem more likely to diminish a patient's chance of recovery than treatment by bleeding.

The experience of one of the authors supplies the following cases: Three men, all Filipinos of approximately the same age, weight, and physique, were overcome by illuminating gas while sleeping in a room together. One was treated during the following day by withdrawing blood and injecting saline solution saturated with oxygen. For a second, a transfusion of blood from another and unpoisoned Filipino was performed. For the third, nothing was done beyond the ordinary procedures of good nursing. The first two died in the course of the two or three days following the asphyxiation. The third survived, but when seen three weeks later had recovered only sufficiently to answer the simplest questions regarding his name and where he came from.

Thus it appears that about all that can be done for cases of carbon-monoxide poisoning is to administer artificial respiration when the person's own breathing has failed or is feeble, to administer oxygen for not more than half an hour, to keep them warm if the temperature has fallen, to supply water to the system, preferably by a Murphy drip, and otherwise to give them good nursing and such symptomatic treatment as may be called for. Anything beyond this is more likely to do harm than good.

EDITORIAL.

PROPER DEDUCTIONS FROM LABORATORY RESEARCH.

On a number of occasions we have been bold enough to call attention to the prevalence of a tendency on the part of laboratory investigators to reach positive conclusions in regard to the action of remedies as the result of a limited number of experiments upon animals or an even more limited number of experiments upon healthy men. In a very large number of instances the conclusions arrived at contradict those which the profession has come to after many years of experience. The laboratory investigator without clinical experience and fortified by the belief in the accuracy of his instruments and methods has no hesitation whatever in expressing his belief that his clinical brethren, while perfectly honest, have, nevertheless, been wofully mistaken, when the chances are that laboratory technique has been correct but the sweeping deductions wrong. On previous occasions also we have expressed the feeling that laboratory investigation is to be encouraged by every means.

There can be no doubt that the results of laboratory investigation have corrected many errors and pointed the way to new methods, although, sometimes, having the glamor of scientific accuracy about them, they have been enthusiastically adopted with disappointing clinical results. One of the factors which stands in the way of laboratory investigation being directly applicable to clinical medicine is that animals are used, and that these animals are either in a state of health or, if diseased, are suffering from disease in which the measures used cannot be expected to exercise a favorable influence. The results obtained from animals may be of value, but their bearing must be given proper weight and direction. The observations of the clinician have been made in practically every instance in the presence of disordered function, or disease, and this very disorder of function or disease causes the human organism to react differently to remedies than it does in health. This difference in reaction is too frequently ignored in the study of drugs, yet it is obviously important. Ehrlich, and many others, have shown how differently cells respond to stains when they are diseased and when they are in health. To such an extent is this true that the pathologist uses certain stains to determine that certain cells are diseased, since he has found by experience that these stains do not affect healthy cells. It is also true that different individuals react differently to the same agents, whether these agents be factors which induce disease or whether they be drugs designed to cure disease. In other words, the thing that the profession is to be most cautious about at the present time is "to make haste slowly" in the acceptance of positive laboratory findings, and on the other hand, not to be driven by the dogmatism of some laboratory investigators into an antagonistic and unbelieving frame of mind.

In the *Archives of Internal Medicine* of May 15, 1917, there appeared two articles which serve to illustrate our meaning. One of these is entitled "The Reflex Action of Volatile Irritants on the Circulation." The authors start out by making the statement that among the measures in common use in combating conditions of threatened or actual circulatory failure is the subcutaneous or intramuscular injection of volatile substances of a highly irritant nature, such as ether, alcohol, or camphor dissolved in ether, alcohol, or oil, and they add that the clinical use of these substances in shock and allied conditions is based not on exact experimental observation but on casual bedside impression and tradition.

We confess that we did not know that ether and alcohol were commonly given hypodermically for the purposes named. They then go on to state that as a result of both laboratory experiments and clinical

observation they have come to the conclusion that these substances do not act as direct stimulants to the circulation but cause a reflex action arising from intense irritation of sensory nerve endings, and they admit that this reflex irritation may be the cause of the rise in blood-pressure which is supposed to occur. They therefore undertook experiments upon cats. The animal's brain was removed under ether and the temperature of the animal maintained by an electric pad. Twenty minutes was allowed to elapse after decerebration in order that the shock of the operation and the effect of the ether might wear off. As the result of their investigations they reached the conclusion that volatile irritants are not direct vasomotor stimulants, that they act reflexly through irritation of sensory nerve endings. Further that their effect on blood-pressure is both slight and transient, and in conditions of abolished reflex irritability, as anesthesia, shock, etc., the volatile irritants are without effect on the blood-pressure; and finally, for these reasons, that their clinical value is questionable. It is of advantage to the clinician to know how remedies which he employs produce their effect, but from one point of view he cares little whether these remedies act by reflex irritation or by direct stimulation; the result is what he seeks. The conclusions in this paper, scientifically accurate as to detail in the experiments, should be that these irritants produce these effects in decerebrated cats. It is a far cry between the clinical observation that they often do good in human beings suffering from circulatory depression to their impotency in decerebrated cats. In other words, these experiments are of value as far as they go, but it is a mistake to attempt to prove that they indicate something far beyond their scope.

The other paper which has attracted our attention appears in the same issue, and curiously enough controverts an opinion which has been held for many years by the majority of the profession, although the subject is pathologic rather than therapeutic. In this paper M'Junkin reports a study upon the human and animal liver after alcohol. He discusses some of the theories which have been advanced in regard to production of cirrhosis, and notes that for many years the excessive use of alcohol has been considered one of the chief causes of this disease. It is only fair to state, however, that he studied the livers of human beings who were known to be alcoholics, as well as the livers of animals which received alcohol in doses which might fairly be considered toxic. The conclusions which are reached by M'Junkin are interesting, and if confirmed by other investigators, as they probably will be since other work has been done along this line, are to the effect that alcohol does not act directly on the liver to produce a cirrhosis, and, furthermore, that it not only does not produce a cirrhosis but it produces no noteworthy lesion whatsoever in the liver cells. Or to use his words in the closing sentence in his article: "So-called alcoholic cirrhosis is not produced directly by ethyl alcohol—that is, the liver is not injured by the alcohol carried to it through the blood or lymph."

All research aids knowledge. Often results which seem barren of practical value prove of infinite value later on, particularly if other studies reveal the line of their importance. The point is to weigh and value each research, but not to let it disturb our experience until it is proved beyond doubt that the clinical observations have been erroneous.

RESPIRATORY ACTIVITY IN SURGICAL SHOCK.

Nothing interests the practical clinician and surgeon more than communications from laboratory workers as to measures which they may employ in the treatment of conditions which are grave and threaten life. So many of our plans of treatment have to be based upon empiricism that we welcome any investigations, or deductions from investigations, that seem to put treatment upon a scientific basis.

Much has been published from various

laboratories during the last ten or fifteen years in regard to surgical shock, and opinions amongst physiologists who have investigated these conditions have been as divergent as have been the opinions of some clinical surgeons and physicians. The present world war has already given us many interesting facts in regard to shock, and, when the opportunity arises, many additional facts will doubtless be published which will aid materially in a correct conception of this state. One thing seems to be fairly well assured, namely, that the view held by clinicians for many years, that surgical shock consisted in severe vascular relaxation, so that a man is bled to death into his own blood-vessels, is the correct one, and the measures instituted to prevent this stasis of the blood in great venous trunks have produced better results than any others.

One of the investigators who has been most sane and interesting in his investigation of this important subject is W. T. Porter, who, in the *Boston Medical and Surgical Journal* of May 17, 1917, points out that a very great fall in diastolic pressure may occur rapidly and speedily destroy the patient. He emphasizes the danger of the patient bleeding into his abdominal veins, and therefore advocates that the head be put below the level of the abdomen. He also recognizes the value of the intravenous injection of adrenalin in normal saline, but he realizes that this treatment contracts the arteries without making the great veins give up the blood stored in them. This blood must be taken from its ponds or wells by some mechanical means.

The most potent factor in aiding in the emptying of the great veins is the movement downward of the diaphragm whereby a negative pressure is produced in the thorax, and, as Porter points out, this respiratory suction is so great an aid to the circulation that a man with weak arterial tone would faint every time he stood up if it did not serve him. The point is, therefore, in cases of shock to produce powerful and complete contractions of the diaphragm, and for this purpose Porter makes the rather startling suggestion that the patient inhale CO_2. If pure CO_2 cannot be obtained the patient may be made to breathe in and out of a rubber bathing cap, whereby CO_2 accumulates in his blood, the cap being removed as soon as oxygen hunger appears, and then, after a few breaths of ordinary air, replaced. An accumulation of CO_2 in the blood acts as an efficient stimulant to the respiratory center, and this, in turn, causes complete contractions of the diaphragm, which results in the emptying of the great veins into the heart.

Porter states that he has not, up to the present time, had an opportunity of testing this method upon human beings, but in animals in which surgical shock had been induced and in which the diastolic pressure was dangerously low, he could by these means raise the diastolic pressure from fifteen to thirty millimeters of mercury. Of course, it is well known to physiologists that any slight increase in the CO_2 in the blood not only stimulates the respiratory center to greater effort, but also stimulates the vasomotor center so that there is a rise of blood-pressure. Porter adds to his interesting communication that he is now on his way to France, where he hopes to have opportunities of trying this method on human beings, and, if it proves as effective in man as it has been in animals, he feels sure that an easy method for the treatment of traumatic shock in man has been devised.

THE VALUE OF PERTUSSIS VACCINE IN WHOOPING-COUGH.

Vaccine therapy, having passed through the days when it was popular because of its novelty, has now perhaps approximated its proper level. We think it a fair statement that in many conditions it has been exceedingly disappointing, and we think it equally fair to state that occasionally it seems to work wonders, and then to disappoint us in a similar case by failing miserably.

There are few diseases which have a higher mortality amongst children than whooping-cough, and there are few diseases in which such a host of remedies have been recommended and tried. The introduction of pertussis vaccine it was thought would serve materially in shortening the course of the disease and in modifying its symptoms, but it was evident at the very first glance that unless it proved singularly efficient it was doomed to failure, since repeated hypodermic injections in children are regarded both by the patient and the parents with a good deal of misgiving, and oftentimes the crying and screaming induced by the hypodermic injections precipitate an unusually severe paroxysm of coughing. It is, therefore, important to reach definite conclusions in regard to the exact value of this measure of giving relief, but it is probable that up to the present time such information is not yet at hand. Occasionally, a paper appears in one of the medical journals in which the author expresses himself as satisfied with the results which he has obtained, and the next week another article appears in which the results have apparently been disappointing.

This condition of affairs is to a certain extent represented by two papers which appear in the *Journal of the American Medical Association* of May 19, 1917. In the first of these, by Sholly, Blumm, and Smith, a report is given as to the results they obtained in the New York City Health Department during the late summer of 1916. They found by careful study that it was difficult to determine how much immunity is conferred by prophylactic doses of pertussis vaccine because so large a number of children seemed to be naturally immune. Thus, out of two hundred and forty-three families, the children of which were exposed to whooping-cough, seventy-seven families, or 31.6 per cent, exhibited immunity in some of the children, and in a series treated by Luttinger 29.3 per cent showed partial immunity.

As these authors point out, statistics to be of any value must be drawn from several thousand cases, and observers must beware of impressions. They found that of all the cases the shortest course was run in the cases of vaccinated controls, and they conclude that more obervations and more clinical observations with controls for comparison must be had before the case can be considered made out for the curative and prophylactic value of specific pertussis vaccine.

The other article, contributed by Luttinger, upon "The Value of Pertussis Vaccine as a Curative and Prophylactic Agent in Whooping-cough," reaches somewhat more encouraging conclusions. He believes that the results warrant the routine administration of pertussis vaccine for both curative and prophylactic purposes; that for curative purpose the best time to institute vaccine treatment is in the first and second week of the paroxysmal stage; and that by its use the disease is materially reduced in duration and severity. An interesting point which he makes is that subconjunctival hemorrhages occur in cases successfully treated by prophylactic doses, and as in these cases the paroxysms were modified or prevented, this fact would seem to indicate that the hemorrhages are not due to the violence of the cough, but to some specific influence of the infection upon the conjunctival vessels.

ANAEROBIC WOUND INFECTIONS.

To the American surgeon, since he is soon to be called into active service where he will deal with these affections, all studies of the anaerobes, particularly the forms which cause gas gangrene, are of immediate and prime importance. Thus it happens that Ivens's communication (*Proceedings of the Royal Society of Medicine*, February, 1917), though the experience has not been so large perhaps as other writers, is worthy of note, because of the careful study given this subject. He observes that the highest number of gas gangrene cases was reached in July, 1916, and that out of 127 wounded admitted

during twenty-four hours gas gangrene infection was present almost without exception. Under circumstances such as these bacteriological studies were not always feasible. Smears, however, were stained and scoped and a provisional diagnosis was based on the finding of many Gram-positive bacilli. This bacteriological blacklist coincided closely with the cases which went up for immediate operation from the wards, which was not surprising since we know that all pathogenic agents of gas gangrene, such as Bacillus aerogenes capsulatus, Bacillus perfringens, Vibrion septique, Bacillus œdematiens, and Bacillus fallax, are all Gram-positive when examined in the discharge fluid.

According to Agnes Savill the *x*-ray shows not only the projectile and fracture, but a special tracery, streaking or striation, associated with the presence of gas in or between muscle fibers. Some special characters even help us to differentiate between the fatal Vibrion septique and the more innocent Bacillus sporogenes. The *x*-ray plates may show a virulent infection in the deep muscles, which demands radical treatment while still localized.

There are many wounds where the gas-producing microbe is present without any gangrene, and with only a trace of gas infection. These microbes, being largely of intestinal origin, are specially associated with the fecal contamination of skin, clothing, and soil. Their virulence is increased enormously by the presence of streptococci. Although the numbers of wounds of the upper limb and chest are greater than those of the pelvis and lower limb—viz., 299 to 197—yet the mortality is three times as great among the gas infections of the lower limb as among those of the upper, viz., 31 to 10 (including three from tetanus). The nearer the soil the greater are the possibilities of infection.

The general proportion of shell to bullet wounds is as 2 to 1. In cases of gas infection the proportion is as 3 to 1, and in cases of gas gangrene the proportion has been 6 to 1, due probably to the infected piece of clothing which the jagged shell carries in, and the greater destruction of tissue. In nearly every case of severe gas infection a foul-smelling piece of cloth can be found in the wound.

Occasionally, more especially after transport, quiescent cases flare up with signs of acute infection. The *x*-rays show no projectile, but one finds in the depths of the wound a piece of infected capote. The infection has probably been kept under control by the use of strong disinfectants, but breaks out when there is a prolonged interval between the dressings.

In some of the worst cases of gangrene an interval of several days had elapsed between the infliction of the wound and the first surgical intervention. In contrasting the gravity of these cases nothing has been more remarkable than the influence of this interval, other conditions being equal. After an attack at the end of May, 1915, the cases came in unusually early, indeed after a few hours. The wounds were very similar in character to others coming in on other occasions after a longer lapse of time, but the results were immeasurably superior, and not a case of massive gas gangrene nor a death occurred, although gas infection was prevalent. Whereas when suitable surgical treatment is delayed even a slight flesh wound may be fatal in the presence of a virulent infection.

Vascular lesions have an important influence in the production of gangrene. With complete blockage of the circulation a suitable soil is prepared for gas gangrene, though the gangrene is not necessarily due to the gas infection. It is obvious that such conditions favor the rapid development of gas organisms. Twenty-two cases of gas infections with vascular lesions have been noted, of which six only have been followed by gangrene.

Ligature of an important artery or vein singly does not seem to increase the incidence of gas gangrene noticeably. Wounds which affect both venous and arterial channels are more serious. In two cases of ligature of the superficial femoral artery, and in two of thrombosis of the femoral vein, no gangrene occurred. In four cases

of ligature of the popliteal artery gangrene occurred in one only. In three cases of ligature of the brachial artery no gangrene occurred; in one where both artery and vein were injured there was gangrene; in another, thrombosis of the artery occurred as a secondary result of the infection.

The complication of the wound by a bone lesion increases the incidence of gangrene. In 464 cases infected by gas organisms, at least 60 per cent were complicated by fractures.

Wounds of the calf involving the vessels, with or without fracture, are dangerous unless treated early and energetically. There is a tendency to the accumulation of gas and pus under the deep fascia and to increased absorption and spread of infection. In the same way wounds implicating the trunk, hip-joint, or pelvis are grave because the opportunities for free drainage are limited. Even a mild gas infection may lead to a fatal termination in such a situation.

Increased intramuscular tension is a powerful factor in the transition of a gas infection to gas gangrene. Where the wound of entry is small or closed the bacterial products accumulate under tension. The muscles involved tend to become gangrenous early from arrested circulation due both to pressure and absorption of toxin. When the sheath bursts gas spreads very rapidly in the subcutaneous tissues.

Tight bandaging, and more especially plaster-of-Paris splints, act in a similar manner. Some of the worst cases of gangrene have arrived with the fractured limb encased in plaster, with the swollen tissues bulging above and below. The French gouttieres are not attended by this danger, and for transport of freshly wounded soldiers are very useful and comfortable. The one flaw in the favorite Thomas splint lies in the pressure from the shoulder or thigh ring.

Joint injuries, while considerably increasing the gravity of the case, do not seem to have any direct influence in the production of gas gangrene. Among cases of massive gangrene a joint lesion was present in under 20 per cent.

Dr. Weinberg, of the Pasteur Institute, and his colleague M. Seguin, were good enough to study in detail the flora of a considerable number of cases, and from their expert knowledge of this very special branch of bacteriology were able to give not only information of the greatest value, but also serum specially prepared for some of the different forms of anaerobic organisms, to the employment of which the author refers later.

Some interesting facts stood out. First, the multiplicity of organisms infecting a wound. Second, the preponderating presence of Bacillus perfringens, which was found in practically every case of gas infection. When occurring alone it did not appear to be very dangerous unless deeply seated so that drainage could not be freely established. It did not invariably produce gas or a specially foul smell in the wound. Frequently from its hemolytic properties, or action on capillary walls, there was reddish discharge, together with discoloration and bronzing of the skin, in addition to gas formation. In the *x*-ray photograph swelling of tissue only was seen generally; occasionally in the early stages of gas formation a dappling of gas bubbles. The only deaths occurring where Bacillus perfringens alone was reported to be present were fractures of the pelvis and thorax.

Bacillus sporogenes was reported in culture in forty-one cases, and it was noticeable that, although there was an excessive production of gas and a foul smell, the cases generally yielded to treatment unless combined with more virulent organisms. Bacillus sporogenes often lingers when other organisms die out. The presence of Vibrion septique was reported six times, all very severe cases. In three cases Dr. Dalyell found Bacillus Hibler IX. Some of the more newly described organisms, such as Bacillus histolyticus and Bacillus œdematiens (fifteen cases), were also reported. Again and again it was noted that the association of the strepto-

coccus (fifty-nine cases) with the anaerobes increased the severity and gravity of the infection, a considerable number of cases dying with streptococcal septicemia. While the anaerobes attack the muscle, the streptococcus spreads in the fascial planes. In many cases in which the surface wound showed only aerobic infection anaerobes could be grown from the deeper tissues or sequestra. Negative bacteriological reports must be received with a certain amount of reserve on this account.

In fifteen cases there was clinical (eight) or bacteriological (seven) evidence of the presence of tetanus.

Three of these were local, with symptoms starting in one limb but becoming generalized. Symptoms occasionally developed weeks after the original injury, in one case when the wound had healed. Owing to the uniform early administration of antitetanic serum, the symptoms were masked and their very vague character made the diagnosis extremely difficult. This is peculiarly unfortunate, as in such cases an early diagnosis is followed by good results if massive doses of serum are administered intrathecally, or, failing this, subcutaneously.

The most characteristic feature about these obscure cases of delayed, latent, or masked tetanus is the peculiar facies. They have an anxious, worried look, which appears usually a little before or coincidentally with the pain in the affected limb. They do not sleep well, and careful examination may discover muscular rigidity. The administration of serum by means of lumbar puncture has been infinitely more successful than any other method of treatment.

Cases of gas gangrene and gas infection group themselves into several different classes:

The classic form associated with much gas production and little edema.

The toxic, edematous form, where edema is the most striking feature, though gas may be present.

A mixed form, associated with both gas production and edema.

Local gas abscess.

Superficial and deep-seated gas phlegmon.

Chronic and latent infection.

Septicemia; pyemia.

In the classic, well-known form there is a darkish-red discharge from the wound, a putrefactive odor, great swelling of the limb, crepitation, and the formation of hemorrhagic blebs with bronzing and discoloration of the skin. Nearer the trunk the superficial veins are distended, and a yellowish edema surrounds them. With the onset of septicemia, as the case progresses to a fatal conclusion, there is often a lemon-yellow coloration of the skin, an increase in the pulse-rate, sweating, coldness of the extremities, subnormal temperature, hemorrhagic vomiting, and dyspnea. The patient talks naturally, may eat well, and is generally conscious almost to the end.

Anaerobic organisms may remain latent many months round a piece of shell or capote; hence such cases can in no sense be regarded as clean operations, for there is every probability that if treated as such, acute sepsis will supervene. At any time they may light up and cause abscesses, pyemia, or septicemia. If drained carefully they usually do well, but an inflammatory exacerbation must be expected. This makes brain and joint explorations for latent projectiles peculiarly dangerous. In bone, particularly, do the organisms lurk, hence the necessity for drainage in reamputations, even when a careful bacteriological examination of the surface wound gives a negative report. Often the anaerobic gas organism dies off but the streptococcus remains, while latent cases of tetanus are by no means uncommon.

In the great majority of cases an anaerobic infection of the blood is fatal, and occurs as a terminal phase; the temperature falls, the pulse-rate rises. A blood-culture was made in forty-nine cases, and positive results were obtained in twenty. Of these thirteen were gas-forming organisms and seven pyogenic, six streptococcus and one

pyocyaneus, but double or triple infections were occasionally present.

In septicemic cases when the streptococcus localizes itself with the formation of a fixation abscess (as for instance at the site of a subcutaneous saline injection), the process seems to be beneficial, and to increase the resisting power of the patient to the infection. The temperature usually drops after the incision of the abscess.

On admission steps are taken to make the patients as warm and comfortable as possible with the minimum of fatigue. They are usually worn out and need sleep. After being cleansed the wound is dressed, and a bacteriological swab is taken. The patient, if the case is urgent, is then passed to the *x*-ray room and the necessary photographs or localizations are done. If there is no urgency he is allowed to sleep until the morning. (The majority of the cases arrive in the evening or during the night.) If requiring immediate treatment the patient is taken to the theater from the adjoining *x*-ray room and operated upon at once. If there is so much collapse as to negative operation, subcutaneous or rectal salines are given, with suitable stimulants, and the patient is left to sleep for a few hours before any operative measures are undertaken.

A rough bacteriological diagnosis from a smear from the wound, as to the presence of many Gram-positive bacilli and streptococci, accompanies the patient to the theater with the *x*-ray plates. If the wound is recent and superficial, it is excised entirely and sewn up, but few cases are received sufficiently early to be amenable to this form of treatment. Usually the wounds are fully opened up by cutting away bruised and infected tissue so as to make the wound conical, and foreign bodies, including portions of clothing, are removed. In addition, in the case of a perforating wound, a piece of gauze, soaked in iodine, is drawn through the wound to cleanse the surface mechanically. Damaged skin and gangrenous tissue in the track of the projectile are cut away, large drainage tubes containing a wick of gauze soaked in salt and carbolic acid are inserted, and a special effort is made to establish through drainage by counter incisions. The opened-up wound is also packed with sterile gauze, moistened with a mixture of 5 per cent common salt and 2½ per cent carbolic acid, and gauze and wool applied under the limb to soak up the copious serous discharge. Very few bandages are used, so that there is no tension, and the limb or wound can be watched.

In the first few months of 1915 the wounds were dressed with 5 per cent salt alone, no antiseptic being used. This was not found to be entirely satisfactory; some pyogenic bacteria flourished, especially Bacillus pyocyaneus, and it was painful. The addition of a small percentage of carbolic acid obviated these difficulties, and for eighteen months has so far proved superior to all other dressings, such as Carrel's various solutions and eusol, which have also been given a trial. It has also been used successfully in many hundreds of cases and cleanses very dirty wounds in a few days. It does not, however, entirely prevent streptococcal infection, which is much more difficult to treat, and a modified form of iodine vaccine therapy was tried on a number of Arab patients in one ward. After preliminary surgical treatment of the wounds they were packed with iodoform gauze soaked in a weak solution of iodine: Iodine, 1 dr.; iodide of potassium, 2 dr.; aqua, 25 oz. This dressing was renewed daily. Whether the Arabs are peculiarly resistant to infection, or whether this treatment was the cause, one cannot say, but a considerable number of very badly infected cases recovered, and there was no tendency to the development of streptococcal septicemia. Only one case of gas gangrene died, and the rest made surprisingly good recoveries. It is possible that this absorption of the products of dead microbes by the deeper tissues of the wound surface has an influence in increasing the resistance of the body.

Free drainage is obtained by the removal of loose fragments of bone. Where there is a linear fracture of femur or humerus with a bad infection, it has occa-

sionally been found necessary to trephine or to remove a portion of the compact bone to provide free drainage. Often these cases with severe comminution make excellent recoveries if the infected bone is removed, the wound excised, and free incisions made down to the muscular sheaths to relieve tension. The immobilization of fractures in gas infections is often a difficulty. It is important to avoid the least pressure and tight bandages. No plaster of Paris is used. Fractures of the forearm are treated by the long, wooden, back splint suitably padded, the forearm being put up in full supination. The dressing is so arranged that the case can be watched, wool and padding being placed under the limb to absorb discharge. Most fractures of the arm are treated by Thomas's humerus splints, made with specially large rings to avoid pressure, abducted to a right angle. The case can then be dressed with a minimum of movement if the supporting flannels or zinc sheeting are well arranged. Fractures of the femur are also treated if possible with extra large rings. Hodgen's splints have also been used for fractures of the neck of the femur, and for cases of excision of the hip, as suitable abduction frames were delayed in transit. Wallace-Maybury splints have been found useful. For chronic bone sinuses Morison's paste of iodoform and bismuth has been used with astonishingly good results. The cases have healed more rapidly than under any other form of treatment.

Gas infections of the shoulder have been treated in some cases by excision of the head of the humerus; occasionally drainage with fixation has been sufficient, the arm being abducted to get good range of movement should ankylosis take place. Injuries of the elbow-joint have been treated by complete or partial excision, removal of foreign bodies, and very free drainage. In a certain number of cases a considerable amount of movement has been recovered. In some the elbow has been fixed on a Jones aluminum elbow splint with connecting half loop and suspended from a Balkan splint. The patient can then move in bed freely, and there is less tendency to edema. Wrist-joints have been treated by partial excision, with fixation of the wrist in a position of dorsiflexion on a Jones splint. Gas infection of the hip-joint has proved a fatal complication. Recovery took place in one instance only, where a resection was done with very free incisions. In another case it was done after conservative treatment had been adopted, and was too late to avert the rapid spread of gas gangrene. Early resection appears to give the best results, with very free posterior drainage. Infections of the knee-joint have been treated by lateral patellar incisions, and removal of foreign bodies and loose pieces of bone. The joint is washed out and drained for a few days down to, but not into, the joint. The limb is placed on a Thomas splint, with slight flexion of the knee-joint. In many cases good movement has been obtained.

When gas gangrene has supervened in the whole limb, amputation is a necessity. Except in one or two cases, in which injury to the vessels was probably the primary cause of the gangrene, and the gas infection secondary, a circular amputation was performed. No attempt was made to cut flaps through infected tissues. The skin is slightly retracted upward as the muscles are incised. In operating, a tourniquet is applied for the shortest possible time, and, to save time, is usually held and not fastened. Lateral incisions are made almost invariably, so that there is no intramuscular tension in the stump, and no tendency in streptococcal cases for pus to track upward. Amputation through infected tissues enables one to be more conservative, as in a case in which three gangrenous fingers were removed and their metacarpals left a useful thumb and little finger. Where the gangrene is localized to a group of muscles with or without bone injury, the muscular mass is excised, and the wound either dressed with salt and carbolic acid, or 1-in-1000 iodine solution. In such cases in the calf, arm, and forearm, some good results have been obtained. In wounds of the deepest parts of the thigh the results have

been less successful. The nearer the trunk, the more dangerous is the infection, and massive gangrene involving the buttocks and pectoral regions has frequently been fatal. It cannot be too clearly realized that conservative treatment can only be adopted when it is possible to keep the patient under the closest observation. The process spreads with the most terrible rapidity, and what at night appears to be a simple localized flesh wound, in the morning may have become a general infection.

REPORTS ON THERAPEUTIC PROGRESS.

DEVELOPMENT IN THE PARAFFIN TREATMENT OF BURNS AND OPEN WOUNDS.

In the *Journal of the American Medical Association* of June 16, 1917, SOLLMANN says he is of the opinion that paraffins intended for the treatment of burns, etc., should comply with certain specifications, as follows:

Paraffin for use on burns, etc., should be solid, but more ductile and pliable than the official paraffin, and have a rather lower melting point. When intended especially for this purpose, it should be liquid at or below 50° C.; a thin film, when prepared and tested by the methods described in the paper of Dr. Leech, should be pliable at 28° C., and ductile at 31° C.

Sollmann would recommend that in future only paraffins complying with these specifications be used in the treatment of burns. A number of these are enumerated in Leech's paper, and apparently there is no difficulty in refineries producing other brands should they be desired. He believes that these should have the preference over the more complicated and rather inferior mixtures, whether these are proprietary preparations or published formulas, unless a definite advantage can be shown for the latter. As Sollmann has previously said, all the experience he has gathered goes against any such advantages, and he considers experimentation along that line as entirely unpromising. For cosmetic purposes, it may be advantageous to give a flesh tint to the paraffin, by the addition of a trace of scarlet red or sudan.

A number of the published formulas contain added antiseptics, such as resorcin, betanaphthol, epithelial stimulants like sudan red, and aromatic oils like eucalyptol. The last is added confessedly as a mere perfume, and doubtless performs that purpose to some degree. The others—the antiseptics and stimulants—must be absolutely useless. Solid paraffin is used familiarly as a hermetic seal for chemicals. It has been found perfectly successful for that purpose, and it does not lose its efficiency when the substance is incorporated with it. In other words, the film of solid paraffin encloses the added antiseptic, etc., tightly and nearly as hermetically as if it were enclosed in a rubber bag. Only an infinitesimally thin layer at the very surface can diffuse into the wound.

Sollmann has shown this by adding resorcin or phenol to melted paraffin, and pouring this in films of about 2 to 3 mm. thickness. The films were then immersed in water.

With resorcin, 0.2 per cent, in paraffin (0.2 per cent in paraffin, 2 parts; liquid petrolatum, 1 part): After five days the water contained no trace of resorcin.

With 1-per-cent phenol (carbolic acid) in paraffin: In two and a half hours there was a very faint trace, which did not increase in five days. The wax when melted with water showed an abundance of phenol.

Perhaps the greatest difficulty in the use of paraffin treatment is in the application of the first coat of the melted paraffin. This is apt to be painful if the paraffin is at all overheated—and this is often difficult to avoid in practice. The use of a brush with melted paraffin is apt to be somewhat painful, and spraying apparatus for melted paraffin are not very satisfactory.

Sollmann has found that these disadvantages can be avoided by applying for the first coat liquid petrolatum in place of melted paraffin.

Otherwise the application is quite as usual: The cotton film is laid on the liquid petrolatum; then the melted paraffin is painted over the cotton, etc.

Clinically, this method is highly satisfactory. The liquid petrolatum is entirely painless, and protects the wound against excessive heat from the melted paraffin. The liquid petrolatum could be easily applied with an ordinary oil atomizer. However, this is not at all necessary, a thin layer being easily applied with a cotton swab. Dr. Beiter expresses himself as especially enthusiastic over this modification.

The use of liquid petrolatum for the first coat has the further advantage that it promises the effective application of anesthetics, antiseptics, or stimulants to the wound. These would simply be dissolved in the liquid petrolatum (or if insoluble in this, in olive oil). Sollmann has not yet given this method a clinical trial, but has worked out a series of solutions which are very promising. These will be enumerated in his next paper, so that they may be tried more extensively, and in this way any improvement in the treatment of burns may be hastened. It is scarcely necessary to call attention to the fact that under the present circumstances prompt improvements in these directions would be especially desirable.

Almost all surgeons who have had occasion to employ the paraffin treatment express themselves with various degrees of enthusiasm as to its advantages over the older methods of treatment. However, no exact comparisons have been published, so that it is difficult to say how much, if any, of the present enthusiasm is due to novelty. It would be desirable that actual comparisons be made between these methods, by those who have the opportunity and sufficient interest. Such experiments are already being started by several workers; but their value is likely to be proportional to the number of workers engaged; again, especially because early results are particularly valuable.

He would suggest either plain paraffin or the liquid-solid paraffin sequence as a standard of comparison. This would be applied, together with the methods to be compared, to adjacent or centralateral areas. If applied to adjacent areas, the wound should be divided by imaginary lines into zones about two inches wide (oriented by marking the skin outside of the wound). It is important that the methods applied to the same patient should not be so numerous as to interfere with the practicality of the application. If it is at all possible, photographs should be taken.

Line 1: Local Anesthetics.—This appears one of the most promising improvements. Sollmann would suggest that the following be tried out, generally dissolved in liquid petrolatum, and applied by the liquid-solid sequence:

Chloretone, from 1:200 to 1:1000 (soluble in about 200 parts of liquid petrolatum).

Orthoform-New, a 1-per-cent suspension made by dissolving the orthoform in a little alcohol and shaking with olive oil. The orthoform is but little soluble in either liquid petrolatum or olive oil.

Camphor, from 1:100 to 1:20 (it is completely soluble in 20 parts of liquid petrolatum; incompletely in 10 parts).

Menthol, 1:10 (completely soluble).

Line 2: Antiseptics and Epithelial Agents.—These may have a field, especially in the later stages, or with slowly healing ulcers. Sollmann would suggest the following:

Eucalyptus oil, 2 per cent (completely soluble).

Resorcin, 1 per cent in olive oil (nearly insoluble in liquid petrolatum).

Betanaphthol, 1:400, dissolved in a little alcohol and shaken with liquid petrolatum (it is nearly insoluble in liquid petrolatum).

Gentian violet, 1:5000 suspension, dissolved in a little alcohol and shaken with liquid petrolatum (it is nearly insoluble in liquid petrolatum).

Scarlet red, 0.5-per-cent suspension in liquid petrolatum (only slightly soluble).

In the same issue of the *Journal of the American Medical Association* BEITER states that owing to his inability to obtain "ambrine," various paraffin compounds were used by him—formulas containing eucalyptus, resorcin, betanaphthol, resin, cera flava, olive oil, and scarlet red, in ordinary paraffin. Beiter's series of cases represents over 4000 dressings on every conceivable burn, and many lacerated wounds.

Prior to the employment of the wax treatment of burns he had employed the usual methods—various ointments, various aqueous solutions, the bath treatment, exposure to the air, and picric acid.

His technique in the use of waxes was as follows: All burns were carefully cleaned at the emergency hospital by well-trained men, any blebs were opened, and all the skin that could be taken off with ease was removed. The burned area was dried either by exposure to air or by gently wiping the surface with cotton pledgets dipped in ether. Over the involved area a thin film of the wax was painted. (The wax is kept constantly in a water-bath, so that it is at all times ready for instant use.) Over the wax film a thin layer of cotton or a split piece of sheet-wadding was placed and a second film of wax was painted, sealing it to the skin at the edges of the cotton dressing. Over this a heavier cotton dressing was applied, and then the bandage. Beiter found that if the injured surface was wet or damp the first paraffin film would not adhere.

He began with the various paraffin mixtures with antiseptics; but he failed to see any differences, except some disagreeable features with the resin mixtures. For example, the undissolved resin sank to the bottom of the warming receptacle and injured the brush with which the wax was applied, making the application to the injured surface painful. He therefore discarded all drugs in his wax and used the commercial "parowax," applied as above. This was sometimes tinted pink with scarlet red simply for cosmetic reasons.

The question of melting point was at first an important one, because to apply a hot solution to a large area of denuded nerve endings usually brought a prompt and energetic reaction, and to wait until the wax cooled to the extent that a film formed over it meant that it would cool below the liquid state before it could be applied. However, the water-bath or household double boiler holds the melting point very well.

A suggestion made to Beiter by Dr. Torald Sollmann has eliminated the importance of melting-point temperature entirely and greatly simplified the dressing as well as adding to the comfort of the patient at the time of the dressing, and in no way changing the results. His suggestion was that the wound be painted with liquid petrolatum, and further treatment proceeded as with the wax. In this method a layer of liquid petrolatum and then the cotton or sheet-wadding are placed over the injured area before the warm paraffin is painted on the dressing. This method has been followed in all of Beiter's recent cases and is greatly appreciated by the patients, who are the court of last appeal. It is essential that the dressing adhere at least to the skin about the edges of the dressing; otherwise the secretions are poured out over the intact skin, excoriating it, soiling the dressings, and making a disagreeable odor.

Beiter reaches these conclusions:

1. It is an inexpensive dressing; a pound of wax and a pint of liquid petrolatum, together costing about 65 cents, will dress many burns. It replaces the gauze, which at this time is quite expensive.

2. It is a comfortable dressing because it is firm and smooth, and the granulating surface does not grow through it as with the gauze. The paraffin is hard enough to make the dressing somewhat rigid and acts as a splint.

3. It is a cleaner dressing than any Beiter has used because the wound discharge is not permitted to soak through the impermeable wax covering, soiling all the linen that comes in contact with the

patient. As the secretions are sealed up, there is no noticeable odor about the patient, which was a disagreeable factor with former methods of treating these injuries.

4. Superficial burns heal more readily under the wax treatment than with any other method with which Beiter is familiar. This is due to but one fact: under former methods of application of solutions and oily substances, no matter what their kind the granulations penetrated the meshes of the dressing in contact with the wound, and on removal at redressings these granulations were destroyed, regardless of the care with which the dressing was done or the method employed in the removal of the dressings in contact with the wound. The paraffin film method does not adhere to the injured area, and therefore does not injure the granulation tissue and the epithelium that is attempting to cover in the denuded area. Early in the course of the burn, if it is an extensive one, the entire sealed surface of the dressing will be filled with fluid, so that it is merely lifted off. Later, as the wound heals, the secretion diminishes, and the granulations begin to grow, the epithelial islands appear as white points at the site of hair follicles, and from these islands epithelization takes place rapidly because the epithelium is not injured in the dressings and redressings.

5. Deep burns do not repair any more rapidly under this method than any other method. There is no difference in the scars of burns treated by the wax method and any other method. If the true skin is destroyed, the end-result is scar tissue or an ulcer. If scar tissue replaces the destroyed tissue, it performs as does scar tissue that develops under any and all forms of treatment, and as scar tissue has performed since the beginning of time. He has tried treating two sides of a body burned to about the same degree with the wax method, the solution method, and various other methods, and has been unable to detect any difference in the end-result, as to scar.

6. The wax method is much more comfortable at dressing time than any other with which Beiter is familiar, for the purely mechanical reason that the granulations do not grow through it, and it is lifted off painlessly. To those who have to do with burned men this means a great deal. The pain endured by the patient as the dressings were removed under previous methods of treating burns left an unpleasant impression to carry with one on the day's rounds.

7. Beiter thinks there are fewer furuncles on his burned patients since the wax has been used, but nephritis is quite as common.

WATER PURIFICATION IN THE FIELD.

The *British Medical Journal* of May 26, 1917, points out that the water problem of an army at war differs in a hundred ways from the same problem in civilian life. To the military sanitarian in the field every water is necessarily suspect, and his task has always been to devise a simple, rapid, handy method for making the foulest water safe and drinkable for troops on active service, whether in camp, on the march, in trenches, or in the thick of fighting. For years past the Army Medical Department and its scientific experts have labored at this problem; to their credit it must be said that they grasped the bitter lessons of former campaigns, and applied them to the full in this war, with the happy results which all can see. The dangers of water-borne disease and the need for care in the matter of drinking water have been impressed upon officers and men of every branch of the army, and organized bodies of men, trained in their duties by medical officers, have vigilantly safeguarded the water-supply at every point. As knowledge has been gained during the war from laboratory investigations and from practical experience, this has been used to perfect the technique of water purification. Old notions have undergone revision. Thus the test of practice under active service conditions has shown that certain methods, such as boiling and filtration, are difficult

to use or unsatisfactory in their results. Chemical disinfection, on the other hand, which was formerly looked upon with less favor for routine purposes, has proved its value and practicability.

Chemicals have long been used, of course, for three distinct purposes in water purification—to clarify, to soften, and to disinfect. The last-named alone need detain us. It used to be said in the text-books of military hygiene that while disinfection by chemicals was theoretically promising, the difficulties of applying it to the conditions of life in the field were very great. Nevertheless, continuous efforts were made to develop the idea, and the chemical disinfection of drinking-water has steadily gained in favor since the early months of the war. Of the chemical agents which have been tried at one time or another, chlorine and its compounds are by far the most important. Other members of the halogen series have been tried, but chlorine in the liquid state, or in the form of bleaching powder ("chloride of lime," calcium chloro-hypochlorite, CaCl.OCl), or of sodium hypochlorite, seemed to be the only one suitable for sterilizing water on a large scale. More than twenty years ago calcium hypochlorite was tried in a crude way in the Austrian army, but no attempt was made to overcome the disagreeable taste and smell of the water thus roughly chlorinated. The results did not encourage our own military hygienists to adopt the method at that time, although they recognized the strong germicidal effect of chlorine upon drinking-water, and its advantages in this respect over permanganate, acid sodium sulphate, and even iodine.

Twelve years ago, however, the sterilization of water by simple chemicals in the shape of hypochlorites was tried on a large scale in civilian life during a water-borne outbreak of enteric fever at Lincoln, with successful results. Between 1905 and 1911, as we learn from a valuable recent monograph, Houston and McGowan pursued the method further and treated the Lincoln water-supply with an alkaline solution of sodium hypochlorite containing 10 to 15 per cent of available chlorine; while since 1908 Johnson disinfected the notorious Bubbly Creek water, at Chicago, with bleaching powder, the use of hypochlorites for sterilization has spread throughout the United States. In England progress by the civil water authorities along these lines has been slow, but the example set by the Metropolitan Water Board last year in its remarkable experiments with chlorination, and the success which has been achieved in the army, are bound to have far-reaching effects on civilian methods.

In bleaching powder, as has been well said, nature and art have placed at our disposal a simple and invaluable means of sterilizing water on active service; the bulk and weight are very small in proportion to the amount of water which can be treated, and the use of a solid reagent has obvious advantages. It is also, we might add, a comparatively cheap method, and commercial chloride of lime is even less expensive than the corresponding sodium salt. One pound of bleaching powder in 33,000 gallons of water suffices to give one part per million of available chlorine, and in this strength the liberated chlorine can usually be depended upon to kill off the germs of water-borne disease within five hours, the test being the total destruction of bacillus coli. Effective treatment in this manner conters absolute, not merely relative, protection, and Dr. Houston maintains that properly chlorinated water is not only quite innocuous, but can also be rendered tasteless to all but the most fastidious of palates. Speaking of the future of water purification and the popular prejudice against "doctored" drinking-water, he makes the significant remark that the war has taught many lessons, including the necessity of subordinating sentiment to expediency.

Early in the war Professor Sims Woodhead in the columns of the *British Medical Journal* reported that by experiments along the lines indicated above, which were first laid down in England and then adopted on a large scale in America, he has satisfied himself that even a highly polluted water

after ordinary filtration could be made perfectly safe and tasteless for drinking purposes by chlorination with bleaching powder, and that the amount of chlorine needed in any particular instance could be determined by means of the simple iodine and starch test which he described. Further practical investigations by Colonel Horrocks and others indicated a way of treating water with bleaching powder in the field by the Army Medical Department. The fruits of this work have been incorporated in the sanitary organization for the British troops in the various theaters of the war with the best results. Chlorination, preceded where possible by rough filtration, has thus come to be the normal method of water sterilization in the front area, and, indeed, on active service generally. The method has been standardized for the use of the water personnel of the army, and complaints on the score of unpalatability are, we believe, seldom heard.

So far we have spoken mainly of the disinfection of comparatively large volumes of water such as can be stored in tanks and water-carts or run in pipes from makeshift reservoirs. The purification of drinking-water for scattered soldiers or small isolated bodies of troops has presented special difficulties, due partly to the deliquescence of chloride of lime and kindred chemicals in pellet form, and partly to the limitations of human nature. In another column of this issue of the *British Medical Journal*, Dr. Dakin and Major Dunham, of the United States Medical Service, describe a new substance which they have devised for the preparation of stable tablets for disinfecting polluted water by the individual soldier. Their paper illustrates the happy results which may follow investigations into a practical problem when they are carried out along strictly scientific lines, and, incidentally, the power the modern scientific chemist has over his materials, so that he can set to work deliberately to produce a substance fulfilling certain conditions as to activities and solubility which he desires to obtain. The substance which Dakin and Dunham, after several experiments, have selected as fulfilling both the biological and practical requirements of the problem is parasulphondichloraminobenzoic acid, to which, when made up into tablets, they propose to apply the convenient working name of "halazone." The substance can be easily prepared from accessible substances at small cost, and it is estimated that with it a hundred gallons of water—a quantity which would meet the normal demands of two hundred men for drinking-water in a day—can be disinfected for one penny. The result of this research marks a further step forward in the task of safeguarding the health of all soldiers at the front from water-borne disease.

THE INTRAMUSCULAR OR SUBCUTANEOUS INJECTION OF NEOSALVARSAN.

To the *British Medical Journal* of May 5, 1917, HARRISON, WHITE, and MILLS contribute a report which in its conclusions is not in accord with hitherto accepted views on this subject. They advocate the intramuscular injection of 0.6-gramme neosalvarsan dissolved in 1 Cc. of a 4-per-cent solution of stovaine, and made up to 2 Cc. with creo-camph cream melting at 150° C.

This has proved the most comfortable injection up to the present. In some cases it has been accompanied by a hypodermic injection of morphine gr. 1/3. This has been sufficient to overcome the dull ache in the site of the injection, which may last for about six hours afterward.

The solution is effected by dissolving the neosalvarsan in the syringe, the creo-camph is added, and the mixture well shaken.

The injection is made about a point three fingerbreadths below the crest of the ilium, on a line joining the tuber ischii with a point on the crest of the ilium which is perpendicularly above the great trochanter when the patient is upright. The detached needle is driven into the muscle vertically to the skin.

The general reaction which follows an intramuscular injection of neosalvarsan is much less than after an intravenous, and

they have not experienced any cases of vasomotor disturbance—flushing, constriction of the throat and chest, etc.—such as sometimes follows an intravenous injection. The tonic effect is greater when the injection is intramuscular than when the remedy is administered intravenously. It will be remembered that in the early days, when salvarsan was administered intramuscularly, the tonic effect was a pronounced feature in all reports on the subject.

The authors conclude that:

1. The intramuscular or subcutaneous injection of neosalvarsan, novarsenobenzol, or novarsenobillon is superior in immediate therapeutic effect to that of the intravenous injection of salvarsan, kharsivan, arsenobenzol, or arsenobillon.

2. Spirochetes disappear from syphilitic lesions just as readily after the first intramuscular as after the first intravenous injection, and the Wassermann reaction is more quickly influenced.

3. Solution of the dose of neosalvarsan in 1 Cc. of 4-per-cent stovaine and emulsion in creo-camph cream eliminates discomfort sufficiently to make the intramuscular injection of neosalvarsan practicable for routine use.

Since the above was written the authors have given a number of injections in which the creo-camph was replaced by camphophenique, with, so far, encouraging results.

THE SALICYLIC TREATMENT OF RHEUMATISM.

To the *Lancet* of June 16, 1917, CANNON writes as follows:

Being surgeon in charge of H. M. S. *Salamander* off the north coast of Australia, Surveying Service, in 1862, he had a case of acute rheumatism, and, being a thousand miles from a drug store, he wanted to prescribe quinine, but found he was out of it and had only a bottle of salicin, then hardly used in medicine. This he administered with good results. Cannon thinks he must have been thus the discoverer of the salicylic treatment of rheumatism.

Perhaps some curious reader might enlighten Cannon, as he thinks it was the first instance of that great antirheumatic remedy being used.

The late Dr. T. Maclagan stated (*Lancet*, 1876, i, 342) that the idea of treating acute rheumatism with salicin occurred to him in November, 1874.

ARTIFICIAL CEREBROSPINAL FLUID.

In the *Journal of Laryngology, Rhinology, and Otology* for May, 1917, MCKENZIE states that two or three years ago he experienced a small run of cases of otitic meningitis which were treated in the usual way by drainage with considerable success. Thinking over the fatal cases, it occurred to him that for purposes of lavage of the cerebrospinal spaces and cavities an artificial cerebrospinal fluid ought to have preference over the usual normal saline, as the latter is apparently a fluid foreign to these regions.

Unfortunately—or fortunately—he has not since had an opportunity of trying the fluid, and as some efforts are now being made to treat epidemic meningitis by lavage, it may be well to publish the constitution of the fluid McKenzie employed.

The following, then, is the formula; it was prepared for McKenzie by Dr. Wyatt Wingrave:

Potassium chloride	3.5
Sodium chloride	1.5
Potassium carbonate	0.2
Glucose	2.0
Distilled water	100.0

This forms a stock solution, from which the fluid for use (sp. gr. 1002) is made up as follows:

Stock solution	10
Sterile distilled water	90

Care must be taken in sterilizing, as boiling the saline-glucose solution decomposes the glucose. For that reason, in making the stock solution, the salts should be dissolved in the water and the solution boiled before the glucose is added to it. McKenzie knows of no method of sterilizing the glucose itself.

In any event, it is advisable to have the stock solution freshly made for each case and its dilution effected in the operating theater.

This fluid does not, of course, contain any of the internal secretions with which modern research is acquainting us, such as those of the pituitary gland, and time and experiment are needed before one can say how much pituitrin, if any, should be added to the solution.

DIARSENOL ADMINISTERED BY BRAYTON'S SIMPLIFIED METHOD OF GIVING SALVARSAN.

In *Colorado Medicine* for June, 1917, Low states, since reading Dr. F. A. Brayton's article on the simplified method of administering salvarsan, he has been using it in giving diarsenol, the Canadian product.

This method is very simple, the time expended from the beginning of sterilization until the procedure is completed being only twenty minutes.

The apparatus used consists of:

1. One 30-Cc. Luer syringe with needle.
2. One glass-stoppered 60-Cc. shaking bottle containing 25 glass beads.
3. One bottle of 15-per-cent freshly prepared solution of sodium hydroxide, with medicine dropper.
4. One 50-Cc. glass funnel.

The above described apparatus is sterilized by boiling in freshly distilled water in an eight-inch aluminum pan. The shaking bottle, containing 30 Cc. of water, is removed from the pan and the diarsenol added. It is then shaken until a clear amber solution exists. Fifteen-per-cent sodium hydroxide is then added until the precipitate which at first forms is dissolved.

The solution is now poured into the glass funnel, in the bottom of which is a pledget of sterile cotton, and filtered directly into the barrel of the syringe. Insert the plunger, attach the needle, and express any air from the syringe. Proceed as in any intravenous injection. The arm is prepared by washing with soap and water, drying with ether, then applying 10-per-cent tincture of iodine over the area.

It is readily seen that both time and labor are saved by this method. The solution can be injected in from thirty to forty seconds, while with the gravity method it takes from ten to fifteen minutes. One can always be sure the needle has not passed through the vein by withdrawing the plunger slightly and noticing the blood mixing with solution, if the needle is in the lumen of the vein. No air can enter the vein in using this method.

In a series of twenty-five injections by this method, during the last two months, Low is convinced that the reaction is less than when using larger amounts of water. The so-called "water faults" are practically eliminated. Diarsenol gives less reaction than salvarsan; its influence on the Wassermann test is positive; its toxicity is lower; and finally, this method is an office, one-man procedure.

[We doubt if a rapid injection as advised is wise.—ED.]

CAMPHORATED VASELIN OIL—A WARNING.

The *Lancet* of June 16, 1917, says that owing to the fact that liquid vaselin is easier to sterilize than olive oil, certain French pharmacists have been tempted to utilize it in the preparation of camphorated oil. The substitution is not always devoid of consequences. Several instances were recently brought before the Paris Surgical Society of extensive and obstinate indurations which had resulted from injections of *soi-disant* camphorated oil. In every instance inquiry elicited the fact that vaselin oil had been used in the preparation. Histological examination showed the indurations to consist in the main of inflammatory tissue containing numerous polynuclear cells. Physicians should not be tempted to prescribe, or dispensing chemists to substitute, liquid vaselin oil for the more assimilable vegetable.

[Vaselin probably prevents the absorption of the camphor.—ED.]

PROLONGED FEEDING THROUGH NASAL TUBE.

Moore in the *British Medical Journal* of May 12, 1917, reports a record case of this character:

Michael McA. was admitted to the Donegal District Asylum, Letterkenny, on January 27, 1885, and died there on April 2, 1917, at the age of eighty-one years. For several years after his admission he had to be spoon-fed, but for the last twenty-one years and seven months he was fed three times daily through the nasal tube. He enjoyed excellent health until the last three months, when he began to fail. Moore never heard of his taking a drink of water for all these years, but during the last two days of his life he took warm milk from a fellow patient, but not from an attendant. The following was his daily diet scale:

Breakfast: One quart of milk, two eggs, 1 1/7 ounces of sugar.

Dinner: One quart of beef tea or beef fluid made with Bovril or Oxo, and one or two potatoes mashed fine enough to go through the nasal tube.

Supper: One quart of milk, one egg, and 1 1/7 ounces of sugar.

THE CONTROL OF TOXEMIA DUE TO PULMONARY CAVITATION AND PUS RETENTION BY POSTURAL TREATMENT.

In the *Southern Practitioner* for July, 1917, Robertson reminds us that we are now told by a number of writers that we have the so-called mixed infection in tuberculosis, and following the latter-day trend our faith and hope is fixed upon some form of vaccine treatment for the relief of the distressing symptoms. Robertson thinks we should regard these cases as pulmonary septicemia, due to the absorption of pus organisms caused by faulty or imperfect drainage. With this conception he has been stimulated to devise some plan by which drainage could be favored, thereby ameliorating the conditions above referred to, and contributing in no small measure to the comfort and well-being of these patients.

Some years ago at the Watauga Sanitarium, Robertson instituted a systematic form of postural treatment to meet this indication, and up to the present time his results have been most gratifying.

In instructing the nurses whose duty it is to carry out this postural treatment, Robertson has explained that these pus cavities are but veritable cups containing pus and a multiplicity of toxic materials, which, if allowed to remain, would greatly prejudice the patient's welfare and materially add to the discomfort and suffering, and that by postural treatment it is his purpose to put the patient in such varying positions as will enable him to turn all the cups upside down during a given period.

The plan outlined is about as follows: In the early morning, after the patient has finished his first morning cough or respiratory toilet, and before he has had his breakfast, he is requested to lie upon the right side for twenty minutes. An hour and a half after breakfast he is requested to lie upon his left side for the same length of time. Toward the middle of the day, before having his midday meal, he is required to lie on his stomach for twenty minutes. In the afternoon he is either placed in a sitting position or allowed to be on his feet for the same length of time; and at some time before retiring for the night he is put in an inverted position, by having him lie upon the stomach, moving him crosswise of the bed, resting his head, supported by his hands, upon the floor. This routine is repeated daily, and of course presupposes that the patient sleeps upon his back, thus giving him a complete postural treatment that will favor the emptying of all pus cavities in his lungs having a satisfactory outlet.

This routine is of course modified to meet individual requirements made necessary by the physical condition of the patient, and it is necessary to use judgment here as in all other therapeutic measures. Robertson has not failed to have a prompt and almost complete disappearance of the group of septic symptoms in every case on which this method has been tried, and he believes

that if it is intelligently carried out in properly selected cases, much good can be accomplished.

Many patients suffering with moderately advanced and advanced tuberculosis will complain that they cannot lie upon the right side, or perhaps the left side, for the reason that it produces an intolerable fit of coughing. Postural treatment will, within a very short time, enable the patient to sleep in almost any position without this annoyance, as Robertson has demonstrated in many instances.

THE ACTION OF ULTRAVIOLET RADIATION IN KILLING LIVING CELLS SUCH AS BACTERIA.

BURGE in the *American Journal of Physiology* of June 1, 1917, says that exposure of living cells to ultraviolet radiation of sufficient intensity to kill the cells, does not decrease to any appreciable extent the activity of the intracellular enzymes.

Evidence is presented in this paper to show that ultraviolet radiation kills living cells by coagulating their protoplasm.

A PRELIMINARY REPORT ON THE TREATMENT OF NARCOTIC ADDICTION.

Writing in the *Medical Record* of June 9, 1917, STOKES asks: What are withdrawal symptoms, and how are they explained? It is well known that on the sharp withdrawal of drugs that depress function we have marked "counterfeit" stimulation, and so it is with narcotics. The wave of "counterfeit" stimulation sweeps from the cortex over the entire nervous system, and is strikingly evident in the preganglionic sympathetic fibers dedescribed by Cannon as going direct to the adrenals, there causing a sharp output of adrenalin, thus inducing an acute sympathicotonic state, in which the autonomous side of the vegetative nervous system, the extended vagus, is inhibited (Biedl, Falta). The clinical picture is that of profound fear so perfectly drawn by Darwin. The wide pupil, pale, clammy skin, the heart running to exhaustion, the gaping, sneezing and other manifestations of respiratory disturbances, with the gastrointestinal tract blanched and motionless—in other words, it is deep vagus inhibition that we see, profoundly overshadowed by the sympathetic. An adequate dose of narcotic holds back adrenalin, tranquillizes the condition, and the relief is immediate and complete.

The fear complex may also be classed as "counterfeit," for there is no adequate emotional stimulus in evidence to account for the condition. The writer long ago pointed out the pathology of the withdrawal symptoms in narcotic addiction, and has since endeavored to unearth remedies that would stimulate the extended vagus, the autonomous nervous system, firm in the belief that when this was accomplished and an approach to the normal balance between the sympathetic and autonomous systems could be established and maintained, the patient would be free from symptoms of narcotic withdrawal. This has been amply demonstrated in a series of 130 cases made up of opium, morphine, heroin, and codeine users.

After a thorough trial, the ductless gland products were discarded, as too slow in action to combat so sharply acute a condition, even where they were reputed to be pronounced autonomic stimulants. It was found that in pilocarpine and eserine we have two remedies that meet the indications perfectly, in doses far below the minimum medicinal doses in common use; for example, the largest single dose of pilocarpine hydrochloride that has been given by Stokes was 1/10 of a grain, with the average dose somewhere between 1/15 and 1/20, repeated every two or three hours for the first forty-eight hours, when the medication is discontinued as a rule.

Soon after the beginning of treatment the face becomes flushed, the pupils narrowed, ptyalism and sweating are induced, the heart action is slowed down, gastrointestinal peristalsis is established, the gallbladder is emptied, the intestinal glands functionate actively, the bowels move, and the patient is hungry. Refreshing sleep

often follows the first dose—indeed, patients often have to be aroused for their medication; they are perfectly tranquillized. If the saliva is swallowed they are apt to be nauseated. While cathartics are sometimes given, they are not always necessary, and should under no circumstances contain any of the hyoscine-atropine group, which is absolutely contraindicated in this condition. If the pulse is slowed down unduly, it is better to cut down the amounts of pilocarpine and eserine, rather than to lengthen the interval beyond three hours, or stop the medication altogether, for if this is done, naturally the patients will show withdrawal symptoms. It is better then to give an eighth of a grain or even a quarter of a grain of morphine, and a half-hour later begin the treatment anew, giving the two remedies in reduced doses. These small doses of morphine merely hold back adrenalin, in addicts, and cannot be regarded as narcotic. All food, in fact everything by mouth, is withheld for some hours, in order to avert antiperistalsis.

There have been no untoward symptoms in any case in this series, which has included valvular and myocardial disease of the heart. One patient, a physician, seventy-six years of age, forty years an addict, whose wife reported that he had been taking 130 grains of morphine a day, was taken off abruptly without incident. In this case, however, some days later, the patient had outbursts of rage without provocation, and was irritable and impatient. He was treated under crude and unfavorable circumstances, which materially interfered with the adjustment of his nervous system to the problems of reality that had passed him by during his long period of narcotism. While his general physical condition improved, on account of his surroundings and his advanced age it was deemed wise to give him the amount of morphine that would tranquillize him, which was found to be three grains. He can be taken off under more favorable circumstances without doubt. Other elderly patients treated privately have done well.

Psychic shock or unfavorable emotional stimuli of one sort or another are likely to disturb the nice balance in the vegetative nervous system, and throw the patients into withdrawal symptoms—in fact, Stokes has many times deliberately brought this about.

As the patients are apt to be wakeful the second night, it is customary to give veronal in divided doses, beginning the afternoon of the second day of treatment. All craving ceases after the treatment is under way, and the patients cannot tell when the narcotics are discontinued. The picture reminds one of that seen in the crisis of pneumonia; it is one of complete tranquillity. Unless the physician has a clear understanding of the pathology of the condition as herein outlined, and the indications for the variations in treatment, he will be likely to be disappointed in his results.

It is interesting to observe the types of minds uncovered in this way; in fact, in some cases the underlying factors in the cause of the addiction, and there are always underlying causal factors, stand out strongly in evidence. The common type of mind is that of an older child, a mind neither hardened nor matured through contact with reality. The physical damage in these cases is soon corrected, for we rarely see complicating organic lesions of consequence. The readjustments in the nervous system take a longer time. It has seemed to Stokes well worth while to explain as far as possible just what is taking place, so that patients can coöperate, and will understand that the readjustments at the psychic level are often tedious and sometimes disappointing. Frank problems in psychiatry must be solved before we can hope for permanency of recovery. Mental and physical fatigue are to be avoided. Strychnine, tea, and coffee should not be given. It may be that in the Abderhalden reaction we shall find a good indicator to guide us in the niceties of after-care.

By robbing the condition of much of the dread of suffering this plan of treatment appeals to addicts, and they soon realize that convalescence begins at once instead of being dragged out unduly through gradual reduction, and other methods that sup-

plant one poison with another. Sufficient time has not elapsed to make any definite predictions as to permanency of freedom from addiction, still the outlook is most promising, particularly if the patients will seek new surroundings and associates, when they resume their former occupations. In the majority of cases the relapses are due to their returning to their old pals and old haunts, where they are soon beset by the insistent drug sellers.

Heroin should be abolished. Stokes found that this drug was used in over ninety per cent of the cases seen by him. Heroin can be completely done away with without adding to the suffering of the sick or harming them; in fact, the United States Public Health Service, in view of the drug evil, has discarded heroin completely, and will take steps to have legislative measures enacted that will further meet this distressing situation.

While the pathology of alcoholism differs from that of narcotic addiction, there are emotional manifestations in this disease that can be tranquillized by playing up the autonomous nervous system. Stokes has seemed to avert delirium tremens in some cases in this way.

PHYSIOLOGY OF THE NEW-BORN INFANT.

In the *American Journal of Diseases of Children* for June, 1917, TALBOT reaches these conclusions:

1. The respiratory quotient of new-born infants indicates that the supply of glycogen in the body is quickly used up, and that the energy is obtained in large part from the body fat until the breast milk "comes in."

2. The energy requirements of new-born infants are smaller per unit of body weight than in older infants.

3. The total calories of the basal metabolism of a new-born infant may be calculated from the following formula:

Total calories = length × 12.65 × body surface.

4. Chilling from exposure or a water-bath depresses the metabolism and with it all the body functions. A new-born infant should not be bathed in water, and great care should be taken that it is not chilled. Warm oil should be used to clean the body.

5. Since a new-born infant is starved until the breast milk "comes in," weak or premature infants should be fed, shortly after birth, preferably with the milk of another woman; but when this is lacking, a 5-per-cent solution of some sugar such as lactose should be given as a temporary expedient.

A COMPARISON OF THE EFFECTS OF BREAKFAST, OF NO BREAKFAST, AND OF CAFFEINE ON WORK IN AN ATHLETE AND A NON-ATHLETE.

In the *American Journal of Physiology* of June 1, 1917, HYDE, ROOT, and CURL state that a weak dose of 1.42 grains of caffeine, without work or breakfast, gradually increased the pulse-rate during the first hour, but in the non-athlete as a rule only after a slight initial fall. In both subjects the pulse returned to the normal rate within three hours. With the larger dose, 2.24 grains, under the same conditions, the increase in pulse appeared more promptly, but in thirty minutes was depressed below normal in the non-athlete, and accelerated above the normal rate in the athlete. The blood-pressure rose above the normal level in one hour, and frequently had not returned to the level in three hours after taking either of the doses of caffeine.

The effects of caffeine taken at different intervals before work varied with the dose and the individual. In the athlete the maximum influence of a dose of 1.42 grains was manifested in three-quarters of an hour, and in the non-athlete three hours after the dose was taken. The athlete did but little more work forty-five minutes after than he did twenty minutes after taking the drug. But the non-athlete did two and a half times as much work three hours after as he did twenty minutes after taking the dose.

Power and endurance for work, and car-

diac activity and increase in blood-pressure, do not keep pace with increase of dosage. The maximum power for work in both subjects was attained with the dose of 2.24 grains of caffeine. With this dose both subjects did two and a half times as much work as they were able to do one hour after eating breakfast. In the athlete with this optimum or with the weaker dose of caffeine, the blood-pressure was no greater than after the maximum work done either with or without breakfast, and the heart-rate was only slightly more accelerated. In the non-athlete the pulse-rate was almost three times as much, but the blood-pressure was no higher than it was after the maximum work following the meal. A strong dose of 3.58 grains depressed the muscular power for work in both men, but very markedly so as well the blood-pressure and pulse-rate in the non-athlete. In the athlete the blood-pressure was no different, but the heart-rate was less after the work following the weaker dose. When the dose was taken in proportion to the body weight, *e.g.*, 0.2 grain of caffeine per 9.3 kilos body weight, or a stronger dose of 0.2 grain per 5.9 kilos body weight, the results presented another view-point to those obtained when the dose was taken irrespective of body weight. The facts showed that of these two doses thirty minutes before beginning work, the weaker dose and not the stronger stimulated the working power in the athlete most. But in the non-athlete the reverse was the case. With the stronger dose the athlete did one-fourth less and the non-athlete one-fourth more work than with the weaker dose. At the same time the pulse-rate was enormously increased in the non-athlete and less so in the athlete, who did double the work done by the non-athlete. On the other hand, the blood-pressure fell slightly in the non-athlete, and fell also or remained unaltered in the athlete, after work and after taking the stronger dose. Therefore, for each subject there was a definite optimum dose which, when increased, proved depressing for muscular work, blood-pressure, and pulse-rate.

One hour's rest did not remove the sense of fatigue produced by the ergometer work, but when caffeine was taken the fatigue of the previous hour's work was inhibited and both subjects did more work then, and even twenty-four hours after taking caffeine, than they did before taking the drug. With the same dose of caffeine and also without eating breakfast, the power for muscular work in the athlete was greater at 4.20 P.M. and in the non-athlete at 8.20 P.M. than at 8.20 A.M. That is, the athlete did his best work eight hours after taking the caffeine and four hours after luncheon, and the non-athlete did his best work twelve hours after taking the dose, and two hours after dinner. At these respective periods the pulse-rate and blood-pressure increased greatly in the non-athlete, and the pulse but not the pressure in the athlete. The after-effect of the larger dose was a heightened condition of irritability that persisted many hours after the drug was taken. The power and endurance for work were increased, and the cardiac activity greatly affected, but the blood-pressure less so than with the stronger dose.

EFFECT OF ALCOHOL ON THE RESPIRATION AND THE GASEOUS METABOLISM IN MAN.

In the *Journal of Pharmacology and Experimental Therapeutics* for May, 1917, HIGGINS in a paper on this subject states that his experiments were made on men, reclining and breakfastless, as to the effect of 30 Cc. and 45 Cc. of ethyl alcohol (suitably diluted but not as alcoholic beverages) on the respiration and the gaseous metabolism.

Alcohol sometimes acted to increase the sensitivity of the respiratory center, as shown by a drop in the alveolar carbon-dioxide tension; sometimes alcohol was without action on the respiratory center.

Alcohol did not have any broncho-constrictor action and seldom any broncho-dilator action, as shown from determination of the dead space of breathing.

The respiration rate was not appreciably affected by alcohol, nor was the type of

respiration changed, unless there was restlessness.

The heat production, as indicated by the oxygen consumption, was ordinarily unchanged by alcohol; in about one-fifth of the experiments there was a rise in heat production of from 5 to 7 per cent.

There are indications in about 45 per cent of Higgins's experiments of a relative acceleration in the pulse-rate after taking alcohol as compared to taking the control solution. In 55 per cent of the experiments this relative acceleration did not occur.

Study of respiratory quotients obtained indicate (1) that 45 Cc. of alcohol is not burned at a faster rate than 30 Cc.; (2) that probably 20 to 40 per cent of the total metabolism is due to alcohol; and (3) that if the rate of combustion continues at the same rate as in the first two or three hours, it requires eight hours before all of the 30-Cc. alcohol and twelve hours before all of the 45-Cc. alcohol is completely burned.

Alcohol diminished the volume of air breathed per minute in a majority of the cases; this was due to diminished carbon-dioxide production.

DRUG USERS IN COURT.

ANDERSON in the *Boston Medical and Surgical Journal* of May 31, 1917, states that the drug habitué in court is a more or less delinquent individual, appearing frequently because of larceny, offenses against chastity, and such. If put on outside probation, two-thirds of these individuals have either to be surrendered to the court or put in non-penal institutions. Two-thirds of the cases he studied were not supporting themselves by legitimate means, suffered from physical conditions that greatly impaired their industrial efficiency and handicapped them in any fight they may have wished to wage against the enslaving effects of narcotic drugs; 81.5 per cent showed some form of mental defect, psychopathic personality, or mental impairment from drugs, which in terms of will-power meant impaired ability to resist.

In the light of the foregoing facts we can understand why medicinal preparations alone do not cure; why short periods of treatment are so often futile.

In the light of the foregoing facts we can question the wisdom of undertaking disposition or treatment of any drug case without determining beforehand his individual ability to profit thereby.

Further, we can strongly advise against trusting a drug user to cure himself, or expecting satisfactory results from any method that does not provide for prolonged detention, careful physical and mental rehabilitation, and upon discharge, well-directed medical and social service methods of treatment.

THE DANGERS OF LUMBAR PUNCTURE.

The *New York Medical Journal* of June 9, 1917, in an editorial says it is exasperating to the enthusiastic physician on the trail of a diagnosis to have the patient himself, or his relatives, refuse to allow a lumbar puncture on the grounds of the danger involved. Perhaps the fluid has been withdrawn once and the patient suffered considerable pain at the time, or, being of a neurotic make-up, complained for days afterwards of a headache, dizziness, pains in back, etc. The temptation is great in such instances, especially where the diagnosis is obscure, and one hesitates between a hopeful and a hopeless prognosis, to tell the apprehensive relatives that this procedure is absolutely without danger. We would be going a little too far, however, in doing this. Let us look into some of the dangers which are actually existent.

First of all, there is the danger of infection. Do we see a smile? Perhaps there are some who are so confident of their technique that infections have been relegated to the limbo of the impossible, wherever that is. But of such the real surgeon is not. About a year ago an investigator who modestly styled himself a "laboratory technician" published in the *Modern Hospital* an account of some careful bacteriological studies which he had made in

operating-rooms, of supposedly perfect technique, but where infection had been occurring with alarming regularity. Platinum loop and test tube in hand, he followed the operations step by step from the time the first package of gauze was put in the sterilizer until the last dressing was put on the wound, taking cultures here, there, and everywhere. And always at some point in the routine he found a flaw. The germ, Lilliputian in its contours, Brobdingnagian in potentialities, fastened somewhere on a link in the chain, and thus the whole chain was rendered weak. So if infection can occur in the operating-rooms of surgeons who make it their constant care to prevent them, they may also occur in the practice of the family physician who, down in the bottom of his honest old heart, looks upon all the refinements of sterilization as just a little absurd. Infection then may occur in lumbar puncture, and this must be borne in mind when urging the family to consent.

Unpleasant after-effects are by no means rare, especially in the class of patients who react badly to everything of this sort. Remembering that "one of the functions of the cerebrospinal fluid is to maintain an equality in the intracerebral pressure, and any sudden alteration, such as is produced by the withdrawal of five, ten, or fifteen cubic centimeters of the fluid, is apt to disturb such equilibrium," headache. nausea, and vertigo which do not always clear up in a day can sometimes be anticipated. Sudden death has even been known to follow lumbar puncture. This is usually due, of course, to a brain tumor, and if this is suspected the greatest care should be exercised. Then, too, the patient may be suffering from general paresis, the course of which cannot be predicted with certainty even a day in advance. The withdrawal of fluid may precipitate or be coincident with convulsive seizures. These may terminate in death, and if we are then able to convince all the relatives that death was not due to the lumbar puncture, our place is in front of His Honor, addressing the twelve good men and true.

Leaving out of the question, however, all actual accidents and sequelæ of spinal puncture, we must consider another class of patients, the neurotic and hysterical. To these the introduction of a needle, which their imaginations represent as Gargantuan, into their spinal column, about which the laity have all sorts of weird ideas, is a mysterious and terrifying thing. The usual association of ideas is injury to the backbone, broken back, and either death or paralysis. It is quite possible then for such individuals to develop a hysterical paralysis, probably taking the form of paraplegia, following this procedure. Here again it is easy to visualize the task before the physician who would persuade the patient and his relatives that the paralysis was imaginary and not caused directly by the puncture.

Let us then not be betrayed by scientific enthusiasm into stating boldly that lumbar puncture is absolutely without danger. We should rather tell the patient and his friends that it is considered an ordinary diagnostic procedure nowadays, that it is necessary to clear up certain points in his particular case in order that we may treat him more intelligently, and that, exercising such caution and skill as will be given to it, the danger is very, very slight.

ONE ROAD TO THE CONTROL OF HEART DISEASE.

In the *Journal of the American Medical Association* of June 2, 1917, SEWALL states that he is writing with the keen conviction that no systematic effort toward the control of heart disease is possible until the practitioner of medicine assumes the point of view regarding the prevalence of latent cardiac disease that he has slowly been led to take as to tuberculous infection of the lungs, that it is to be distinctly excluded in every case coming to diagnosis, and that in our study of the heart we should cease to await the development of the signs of mechanical imperfection, much as in the diagnosis of cancer of the stomach we no longer wait for a palpable tumor. In short, the clinician must learn to recognize heart

disease while it is still a clinical disorder and before its morbid anatomy leads to physical signs.

A mechanical break in cardiac compensation probably finds its chief danger in degradation of cardiac nutrition and consequent depletion of resistance toward infective agencies.

As to treatment, when cardiac infection threatens to develop or when acute inflammation has already supervened, there is one fundamental resource without which nothing is of avail—complete mental and physical rest.

In chronic cases, which are apt to be overlooked unless previous infection has caused mechanical derangement of the valves, it would seem that we cannot do better than to act on the hints from our hard-won experience with tuberculosis.

In an arrested case of tuberculosis, the patient is functionally normal within certain limits; not to overstep these bounds requires a mode of life ordered according to the rules of hygiene which must be carefully adapted to the needs of each person.

DAKIN'S "DICHLORAMINE-T" IN THE TREATMENT OF THE WOUNDS OF WAR.

SWEET in the *British Medical Journal* of August 25, 1917, makes a report upon this important antiseptic which has attracted so much attention during the last few months. He has treated some eighty patients with Dakin's "dichloramine-T"; some have been old cases with foreign bodies lying in the bone, and suppuration did not stop until the foreign body was removed. Fresh cases, in which enough integument was left to permit it, have been treated with dichloramine once and immediately closed, and have healed by secondary intention. Sixteen cases, old and fresh, were cultured after treatment with "dichloramine-T" for varying periods, of which eleven gave no growth whatever; of the five in which a growth appeared, four were old cases of deep bone involvement; the only growth was the staphylococcus aureus in four cases and in one case the pyocyaneus.

The wounds filled rapidly with granulation tissue of healthy color, which exhibits no tendency to exuberant growth and no tendency to become water-soaked and indolent; the skin edges grow in very rapidly.

These results are no different from those which can be obtained by other methods, and no one would believe them if they were any better. Let Sweet say, therefore, that the surgeons of the unit are agreed that the wounds treated by "dichloramine-T" are in every way as satisfactory as they have ever seen under any method; and two of the surgeons have had previous experience in France, while all are surgeons of long experience in civil practice.

The results along other lines are capable of more definite demonstration, and it is on these that Sweet lays the most emphasis.

The new "dichloramine" solution is made by dissolving the crystals of "dichloramine-T" in chlorinated eucalyptol and then diluting this solution by the addition of chlorinated paraffin oil. It is best applied by an oil spray, an ordinary hard-rubber or all-glass atomizer being the most practical method. Metal atomizers are not suitable, since the metal is attacked by the chlorine. This oily solution presents the first great advantage—the dressings do not stick to the wound and the entire act of dressing is relatively painless. The gauze does not have to be separated from the granulations by soaking. It is therefore not even necessary in the average wound to place a waterproof protective covering over the bed-linen while dressing, and the necessity of moving the part or the patient is obviated. The old dressing is simply lifted off, and the wound sprayed; the force of the spray will dislodge sloughs, and the wound is covered with a fresh dressing. It is evident that a very important saving of time results from this simplicity of dressing. One surgeon has repeatedly dressed thirty wounds in ninety minutes—an average of three minutes to each dressing. These figures, and the figures to be given later, refer to the acute wards, where the patients are all bed patients.

The solution contains enough available

antiseptic so that one dressing every twenty-four hours is ample for large, deep wounds, and one dressing every forty-eight or seventy-two hours is enough for the simple or more superficial wounds. Since the solution contains so much chlorine and does not have to be renewed every few hours, the use of the Carrel tube is entirely done away with. The oily solution of "chloramine-T" creeps into all the wound crevices and corners, and it can be readily introduced into sinuses by means of a cotton swab dipped into the solution.

The amount of this new solution needed for wound dressing should be emphasized. At first thought it would seem that a solution containing oil of eucalyptus and paraffin oil would be far too expensive for general use in comparison with eusol. Forty-two wounds were dressed by one surgeon with 35 Cc.; another surgeon dressed 154 wounds with 115 Cc. These figures apply to the acute wards, and include many compound fractures and extensive buttock and thigh wounds. The fact that so little fluid has to be used, and that therefore only the wound discharge has to be cared for, results in a tremendous saving of gauze and cotton. Sweet gives below a table of the results of a comparison of the amount of gauze and cotton used during different periods in the four acute surgical wards of the hospital. Each ward is in charge of surgeons of equal skill, and all trained in the same hospital; the nurses are also all graduates of the same hospital training school; in other words, the comparison is not between workers trained in different schools of surgical technique.

TABLE I.—GAUZE AND COTTON-WOOL USED JULY 5TH, 1917.

Ward.	Gauze (6-yard rolls).	Cotton (1-yard rolls).	Treatment.	No. of Patients.
1	12	2.5	Eusol	23
2	10	4	Eusol	22
3	3.5	2.5	Dichloramine-T	23
4	6	2.5	Eusol	25

Taking a longer period, the amount of gauze and cotton used in seven days by three of the acute surgical wards is given in Table II. Ward 2 changed during this period from the use of eusol to the use of "dichloramine-T;" the figures from this ward are therefore not available. The number of patients was the same in the three wards, and the proportion of relatively slight and extensive wounds in each ward was the same.

TABLE II.—GAUZE AND COTTON-WOOL USED FROM JULY 4TH TO JULY 10TH, 1917, INCLUSIVE.

Ward.	Gauze (6-yard rolls).	Cotton (1-yard rolls).	Treatment.
1	72	38.5	Eusol.
3	33	7	Dichloramine-T.
4	45	18	Eusol.

This saving of material is of importance in several ways. Not only does it effect a saving of labor from the cotton field to the hospital, not only a saving of transport, but an important saving in the hospital itself; the time taken by the nurses in the preparation and sterilization of material can be utilized for the care of the patients, and to this can be added the saving in time, labor, and material by doing away entirely with the need for the Carrel tubes. This need for so little solution in wound dressing, and the fact that the dressing need only be sufficient to care for the wound discharge, mean that the bed-linen is not wet, with a consequent saving in the moving of the wounded, and an increase in their comfort and well-being.

The dichloramine-T solution, like all other chlorine compounds, is a very active lymphagogue in fresh wounds, and the amount of wound excretion may be considerable. The lymphagogic effect may be directly watched in suitable wounds. As granulation tissue develops, the lymph discharge greatly decreases until the wound becomes comparatively dry. The dichloramine-T also possesses to a marked degree the characteristic power of the chlorine solutions in aiding the digestion and removal of the necrotic sloughing tissues. The new solution seems more effective in cleaning up sloughing tissue than the older chlorine compounds. While the majority

of Sweet's cases come from the casualty clearing station in excellent, clean condition, a sufficient number have reached him with necrotic tissue in the wound amply to satisfy him of the rapidity with which the dead tissue is freed under the dichloramine-T. The tendency to secondary hemorrhage is certainly not increased. He has had only one secondary hemorrhage in the series, which includes a number of deep buttock wounds and cases of exposed great arteries of the arm and leg.

The solution is not irritating to the skin or mucous membrane, except possibly in the rare individual who possesses an idiosyncrasy to the eucalyptus oil. Such individuals have been reported in dermatological literature. Among the patients treated in the U. S. Army Base Hospital No. 10, France, Sweet has encountered only one case of dermatitis, but since it did not develop until after two weeks' use of the solution and was accompanied by high temperature, it is not clear that it should be ascribed to the eucalyptus oil or to the well-known action of wound excretion.

The constituents of the solution are stable, although the final combination is not indefinitely stable nor can it be exposed to strong light. It is easily prepared from the constituents. The dichloramine-T which Sweet has was put up in packages of 10 grammes each; the content of one package is dissolved in 75 Cc. of chlorinated eucalyptol and diluted with equal parts of chlorinated paraffin oil as needed, making, therefore, approximately a 6.5-per-cent solution of dichloramine-T.

The first application of the solution to a fresh wound produces a smarting or burning sensation, which passes away in a very few minutes; in some individuals this seems quite severe, but Sweet has yet to see the patient who does not prefer this slight smarting to the real pain of removing a wet dressing which has dried around the edge of the wound. After the second or third application this smarting sensation on applying the solution seems to have disappeared.

Since the time to treat an infection is before the infection starts, it is hoped that the dichloramine-T solution can be given an early trial at the field ambulance and casualty clearing stations.

Conclusions.—Dakin's "dichloramine-T," in solution in eucalyptol and paraffin oil, is of great advantage in treatment, even if the final results in wound healing were no better, because—

1. It saves the pain of wound dressing.
2. It effects an appreciable saving of dressing material.
3. The amount of solution needed is of small bulk.
4. The number of wounds which a surgeon can dress in a given time is far greater than by any other method.
5. The elimination of the Carrel tube simplifies the dressing and the problem of transportation of the wounded.
6. The elimination of the Carrel tube saves the time taken by the nurse for the periodic flushing.

THERAPEUTIC USES OF TUBERCULIN IN UVEITIS.

Woods in the *Maryland Medical Journal* for June, 1917, states that the following conclusions seem to present the proper attitude of ophthalmologists to the use of tuberculin for diagnosis or therapeutic purposes:

First, avoidance of focal reaction in intraocular lesions; second, avoidance of tuberculin as a therapeutic measure in acute cases. Under "acute" there should be included duration and advance of the lesion as indicated by condition of the vitreous, descemetitis, etc. Third, tuberculin is indicated when the trouble is non-progressive, but does not get well; fourth, a positive Von Pirquet, with elimination of other causes, is sufficient basis for the use of tuberculin in therapeutic doses; fifth, the present status of vaccine therapy is so uncertain, in the opinion of even those most expert and experienced, that ophthalmologists owe it to their patients to conduct this treatment under the guidance of one trained in "immunologic problems."

THE USE OF RADIUM IN THE TREATMENT OF CUTANEOUS EPITHELIOMA AND KERATOSIS SENILIS.

In concluding a paper in the *Boston Medical and Surgical Journal* of May 31, 1917, BURNS asserts his belief that radium effectively heals epithelioma and keratosis senilis. The cosmetic results following its use are excellent. An especial field of usefulness is about the nose and eyelids, where surgery is difficult and the results deforming. An advantage over *x*-ray therapy is the accuracy of dosage and the greater margin of safety.

THE USE OF THE LONGITUDINAL SINUS FOR DIAGNOSTIC AND THERAPEUTIC MEASURES IN INFANCY.

The *American Journal of Diseases of Children* for June, 1917, contains an article bearing the above heading, which is somewhat radical in its wording. BROWN and SMITH state in this paper they are able to report 100 cases in which the sinus has been used either for diagnosis or for therapeutic measures. Blood has been withdrawn for a Wassermann test in thirty-nine cases, ranging in age from birth to the oldest, 2 years and 5 months. In the latter the anterior fontanel was one inch across and half an inch in the anteroposterior direction. It was quite firm, but fibrous, and presented no more difficulty in entering the sinus than one would expect from the nature of the tissue at that age. In these cases and the remaining cases the sinus was entered in one or more of three locations: first, the anterior angle of the fontanel; second, the posterior angle of the fontanel; third, along the line of the sagittal suture at a distance of ½ inch to 1½ inches behind the fontanel. They have been equally successful in the three locations, and think that, usually, the one has no advantage over the others. The three locations, however, give three chances for entering the sinus if any difficulty, as occasionally happens, is encountered.

Diphtheria antitoxin has been given in two instances, one being in a ward case, and the second, in an infant seen in consultation, three weeks old, with a bad diphtheritic throat of three days' duration, extremely ill, the infant having had no serum. It was thought that the only chance of saving the infant was by the intravenous injection of a large dose of antitoxin. Twenty thousand units were accordingly given, by means of the sinus route, in a few minutes. This method of giving antitoxin should prove very valuable and save lives that otherwise might be lost.

It was with the view of giving the most intensive treatment for syphilitic infants that they first turned to the sinus in their search for a method of doing this easily and rapidly. Up to the present they have given fifty-two injections by this method. When one remembers the areas of necrosis following accidental subcutaneous injection of diarsenol or salvarsan, this fact will be apparent, that the injection is a good test of the efficiency of the sinus in therapeutic treatments. No cases have occurred in which irritation has followed the injection of the arsenical salts. In one instance adhesions or thrombosis may have occurred, although their only ground for suspecting this was the difficulty experienced in entering the sinus after six injections had been given. This was the first case in which they had given the diarsenol this way, and their difficulty may have been due to lack of experience. The case went on to complete recovery, however, with repeated negative Wassermann tests. In all their other cases they have had no difficulty in giving repeated doses, so that they feel justified in concluding that thrombosis practically never occurs in the sinus as it does in the small veins following the injections.

Having in view the use of the sinus for transfusing purposes, four infants were given a saline solution, using the 20-Cc. syringe to see if any difficulty would arise while changing the syringes with the needle in the sinus. It was found by putting petrolatum on the top of the syringe, and with an assistant preventing the needle from turning by means of an artery forceps,

that the syringe could be removed and replaced without any difficulty. Judging from these saline cases, the ease and rapidity with which the solution was injected, there is no doubt that an infant could be given 100 Cc. or more of blood in a few minutes. The most interesting and practical point is that this could be carried out at the bedside and with only a few minutes' preparation. To emphasize the ease and rapidity of an injection, it may be added that four injections of diarsenol have been given by one of the authors in fifteen minutes, this including the preparation of each individual dose, the preparation of the infant, etc. Any one who has worked with the veins in infants will appreciate the importance of this statement as an evidence of the value of this procedure as a time-saver.

Three cases for blood culture by the Rosenau method were carried out. There was no difficulty in getting sufficient blood, the parts being easily prepared and rendered aseptic. The authors have in mind the use of the sinus for giving sodium bicarbonate solution and for other therapeutic measures, but owing to being shorthanded and having had extra work thrown on them, they are unable to report these cases at present.

SURGICAL ASPECTS OF MALE STERILITY.

In the *New York Medical Journal* of May 26, 1917, WOLBARST reaches these conclusions:

1. The treatment of sterility in marriage requires the most careful study of the generative organs in both parties, preferably simultaneously.

2. A woman should never be subjected to surgical measures for sterility unless her husband has been carefully examined and found capable of fertilization by the systematic efficiency test.

3. In the male spermatic efficiency, judged by the presence or absence of azoöspermia, oligospermia, and necrospermia, must be determined.

4. To give trustworthy results, spermatozoa must be examined immediately after emission in contact with the natural female secretions.

5. In a study of eighty-seven cases, fifty per cent were due to azoöspermia, thirty-five per cent to oligonecrospermia, and 13.5 per cent to oligospermia.

6. Bilateral epididymitis caused azoospermia in seventy-two per cent of cases; prostatitis, vesiculitis, and colliculitis caused oligospermia and necrospermia in seventy-two per cent of cases.

7. Sexual exhaustion (excessive coitus) is a frequent indirect cause of sterility.

8. Gonorrhea is the underlying factor in sixty-seven per cent of azoöspermia; forty-two per cent of oligospermia; fifty-five per cent of oligonecrospermia. Sixty per cent of the total number were due to gonorrheal infection.

9. Syphilis appears to be a slight factor in male sterility.

10. Lesions responsible for the sterility were discovered through the posterior urethroscope in forty-seven per cent of cases.

11. Treatment is surgical and must be applied either to removing the obstruction to the passage of the spermatozoa or to removing the pathological genital secretions which injure or destroy them.

12. Artificial impregnation is indicated in cases of subnormal spermatic efficiency, and is often successful.

13. The probability of cure, excepting in azoöspermia, is about thirty-three per cent. In azoöspermia much less.

GLYCERIN AND ANTISEPTICS.

In the *British Medical Journal* of May 19, 1917, GOODRICH states there is no doubt that in a mixture of water and glycerin more of the ordinary antiseptics will dissolve than in pure water; for example, in a mixture of equal volumes of water and glycerin about five times as much thymol will dissolve as in pure water. However, the resulting solution has no better antiseptic power than the aqueous solution containing only a fraction of the amount of

thymol, as already recorded in the writer's recent paper on mouth-washes. The same is the case with boracic acid: a saturated solution in water will kill all the organisms in a thin film of staphylococcus pyogenes aureus in just over one hour, whereas a saturated solution in water and glycerin containing more than four times as much boracic acid requires about six hours.

Hitherto it appears to have been assumed by pharmacologists that solutions in glycerin were necessarily more antiseptic than the more dilute aqueous solution, and further statements such as the following are liable to be misleading: "Glycerin is largely used in pharmaceutical preparations as a solvent, and, being an antiseptic, it also acts as a preservative" (Squire, 1916, p. 658). It was Sternberg who included glycerin, up to 1 in 4 dilutions, among feeble antiseptics, but even water compares well in disinfecting power with 50-per-cent glycerin. Pure glycerin easily kills protozoa and other animals, but here it acts by osmosis, for it is well known to extract water from tissues. Many bacteria are much less susceptible to fatal effects from drying, and may consequently remain alive in glycerin for hours. Dilute solutions are not even preservative; in fact, up to 8 per cent, glycerin is so beneficial to certain bacteria as to be added to media for growing them.

The experiments mentioned below were carried out in the same way as those described in the writer's recent paper in the *British Medical Journal* of April 14, but with a standard culture of S. pyogenes aureus. The glycerin used was in the liquid form (specific gravity 1.26), pure and perfectly sterile.

To destroy all the organisms on a coverslip film pure glycerin required approximately eight hours; mixed with water in equal volume it required more than twenty-four hours, after these hours giving considerably more growth than the control which had been in tap-water for the same time. For the following experiments a stock solution of the antiseptic was made in water, and this was diluted as required with an equal volume of water or glycerin.

Time Required to Destroy All the Individuals from a Standard Culture of S. Pyogenes Aureus Contained on a Thin Film on a Cover-glass.

Phenol:

3.3-per-cent solution in water required less than ¼ minute.

3.3-per-cent solution in water and glycerin required more than 1 minute (between 1 and 5).

Mercuric Chloride:

0.005-per-cent solution in water required approximately ¼ minute.

0.005-per-cent solution in water and glycerin required more than ½ minute.

Boracic Acid:

A saturated solution (4 per cent) in water required approximately 65 minutes.

A half-saturated solution (2 per cent) in water required approximately 285 minutes.

A 2-per-cent solution in water and glycerin required more than 480 minutes.

Thymol:

A saturated solution (0.06 per cent) in water required ¼ minute.

A half-saturated solution (0.03 per cent) in water required 12½ minutes.

A 0.03-per-cent solution in water and glycerin required more than 300 minutes.

In the case of thymol and S. pyogenes aureus the value of the constant in the logarithmic relation existing between the time required for disinfection and concentration, as given by H. E. Watson, is 5.6. This is almost exactly the same as that for phenol and S. pyogenes aureus, calculated from Chick's results, obtained in an entirely different way. However, the discussion of methods, etc., must be deferred and published with the graphs representing the variations in times required for disinfection with concentrations of these antiseptics; especially interesting are those showing the interference of glycerin and other solvents.

The theory underlying the action of glycerin is most interesting; possibly the glycerin merely acts as oil is supposed to act in the case of carbolic acid—that is, being a better solvent for the antiseptic, the latter does not diffuse so easily from the solution into the watery protoplasm. However, in some ways this explanation is unsatisfactory, and the fact that glycerin diminishes the action of aqueous mercury perchloride solutions suggests that, like alcohol, it does so by diminishing dissociation. There seems to be some difference of opinion about the dielectric constant of glycerin, but probably it is less than that of

alcohol (25), so that it would as a solvent have even less dissociating power. As far as Goodrich knows, it is not generally considered, in the case of such substances as phenol with small dissociation constants, that the antiseptic properties of the solutions rest in the ions; but that such is the case is the most likely explanation which she can at present bring forward to account for the above results.

Whatever the theoretical explanation, however, it is quite clear that in practice it is more than useless to waste glycerin by using it as a solvent for antiseptics, and surely such preparations as glycerin of phenol and glycerin of boric acid should be omitted from the Pharmacopœia. Probably, in any cases where thymol solutions have been found to be unsatisfactory as mouth-washes, the failure is due to the presence of glycerin in them, as in many proprietary mouth-washes in common use.

THE PLACE OF RADIUM IN THE TREATMENT OF CANCER.

ABBE in the *Medical Record* of June 2, 1917, reminds us that radium acts by its enormous and perpetual output of electrical units, shooting out through space infinitely small atoms, each carrying a charge of electricity, some positive, some negative; if indeed, as has been surmised, they are not electricity itself.

The negative electrons (beta rays) have been demonstrated to be the efficient factor in repressing cell growth. The first light is thus thrown on the question of why cells grow. In their disorderly overgrowth they are suddenly restored to orderly action, by supplying them with their lost negative electrons. Logically this implies that their formerly orderly existence was sustained in equilibrium by a due supply of negative charges.

Incidentally, we must recognize the fact that science is about ready to concede that electricity is the vitalizing force actuating all the functions of our life and our cell activities.

It is not surprising that we see, in certain milder epithelial cancers, in myeloid sarcomas, in round-cell sarcomas, in papillomas, a rapid, complete, and apparently permanent disappearance of the tumors, when the correct dosage of radium electrons has been shot into them. It is like quelling a riot, without killing the rioters, and is followed by a resemblance of the cells to correct life order.

To illustrate—an eyelid is engulfed in a tumor so that its edges, the eyelashes, the skin, and shining membranes are effaced in the mass. One correct dose of radium is given. In two weeks shrinkage has begun; in four weeks the tumor is half gone; in eight weeks the lid is restored—smooth surface inside, sharp edge and skin outside. Soon the hair grows in, and in due time one cannot tell on which lid the tumor had grown. Such a case Abbe watched for ten years. The lid remained perfect.

Again, a lad had a lower jaw-bone destroyed for an inch and a half by a soft sarcoma originating in the marrow cells. Radium quickly altered it; retrograde changes ensued; the cells resumed their bone-forming function; gritty points first came throughout the soft mass; then solid bone; then shrinkage, until it took its old shape. Thirteen years have gone by with no recurrences.

Many uterine fibroids (muscle structures) have been partially or wholly reduced by radium and remained so up to twelve years in some instances.

These only illustrate what has happened to thousands of cases. A few such exalt the statistics, no matter how many imperfect results are encountered—failures which skill and time will correct.

But these, it will be said, are not cancer. A Spanish proverb says, "Well lathered is half shaved," and the observations Abbe has made prepare us to understand something of the nature of all cell tumor change under radium.

There is observed a difference in resistance of various types, fibrous structures are hard to affect, although an exception may be made of keloids, which always yield to radium. Cancer is, perhaps, the most re-

sisting of all soft-cell tumors to the subtle powers of radium. There is a growing list of our ardent professional brothers striving to remove this stigma from surgery. The basis of hope lies in the proof that true cancer nests can be influenced by radium to cure themselves, quite as readily as other tumors.

For example, in the early marginal recurrence of true cancer after, we will say, a breast amputation for malignant tumor, the nests of disease disappear under a short radium treatment, and stay cured, unless they have grown to a considerable size. It is not necessary to cut these out to say what they are. Who will say then that the cancer cells are not amenable to the beneficent action of radium?

It is true that if we attack large cancer masses we liberate toxins and weaken the patient for a time. Hence some disrepute has fallen on zealous radium operators, but the disgrace falls rather on the patient or physician, who has allowed delay. The campaign of education is correcting that.

Meanwhile what triumph can radium claim in other cases? One field offering poor hope without radium is opening to us. That faithful pioneer, Dr. Wickham of Paris, strongly urged the use of radium after operation, where even some malignant remnants were necessarily left in the wound. It means the combination of good surgery and radium. Abbe was impressed by cases he showed him twelve years ago, and now esteems the method more than ever.

THE THERAPY OF PELLAGRA.

In the *Medical Record* of June 2, 1917, NILES, who has written so largely on this subject, asserts that the application of medicinal remedies in pellagra is, in the opinion of the writer, fruitful of much benefit. Many of the most distressing symptoms can be either relieved or mitigated, and just because a positive specific has not been found is no reason why a therapeutic pessimism should be allowed to dampen the ardor of the physician. Therapeutic pessimism is the inevitable refuge of the weakling, and if the medical attendant is imbued with that spirit he should hesitate in treating pellagra.

For the sore mouth and tongue an application of nitrate of silver (20 grains to the ounce of water) daily or on alternate days is recommended. A mouth-wash of boroglycerin (25 per cent) or half-strength liquor alkalinus antisepticus, or a combination of chlorate of potash and glycerin, with rose-water as a vehicle, will generally prove satisfactory. For the aphthous ulcers, ofttimes so painful, gentle "touching" with half-strength aromatic sulphuric acid once daily, or a liberal application of a mild solution of salicylic acid in glycerin and alcohol, will be sufficient.

For the salivation give 1/200 grain atropine every four hours till the dribbling ceases; then stop, for the continuance of the atropine would cause uncomfortable dryness of the mouth and fauces.

Should the interior of the buccal cavity and fauces become dry and uncomfortable, a frequent spraying with liquid albolene, to which a little menthol has been added, will prove most grateful.

As a constitutional treatment the writer recommends the following, which has been evolved from his own experience, augmented by suggestions from others in whom he has confidence.

At present the writer employs for hypodermic use 16-minim ampoules of iron arsenite solution, and ampoules of sodium cacodylate, 1 Cc., each ampoule containing ¾ grain of the drug. One of each is injected on alternate days, injecting them under careful aseptic precautions. This injection on each day, but alternating the drug, is kept up for two or three weeks; then the injection is given every second day, still alternating the ampoules, for two or three weeks longer. After that the injections are given only about once a week (still alternating) as long as it is practicable or considered advisable.

Internally it is recommended that a combination of Fowler's solution and a saturated solution of potassium iodide be given, beginning in 5-drop doses and increasing

one drop daily until the physiologic limit is reached. Generally the puffiness under the eyes appears when about 25 to 30 drops are being taken. When this appears the drops should be discontinued for two days, and started at the minimal dose of 5 drops, increasing gradually as before. Some can take larger doses without discomfort than others, but it answers no good purpose to push it after the physiologic limit has been reached. Occasionally the patient, on account of excessive irritability of the alimentary tract, will prove intolerant of arsenic internally. Should this be apparent, the saturated solution of potassium iodide alone may be pushed, given in a little sweet milk.

This is the formula:

Liquor potassii arsenitis, 3 drachms;
Saturated solution potassii iodidi, 5 drachms.

The number of patients who could not tolerate this formula have been extremely few.

After the active symptoms of pellagra have abated, and iron does not seem to be indicated, this formula may be kept up almost indefinitely in 6- or 8-drop doses three times daily.

For the frequent diarrhea, bismuth-beta-naphthol and resorcin, given with milk of bismuth as a vehicle, has generally been sufficient. This failing, there may be given heavy doses of bismuth subgallate. As a last resort, powdered opium or tincture of opium may be used, but opium, as an intestinal astringent in pellagra, has its disadvantages, as it seriously interferes with the much-needed elimination. The writer prefers 10-grain doses of tannigen, given as indicated by the severity of the diarrhea.

When there is a paucity or absence of free hydrochloric acid in the gastric secretions, 10 or 12 drops (not more) of dilute hydrochloric acid, well diluted and given thirty minutes after meals, will often greatly aid digestion and lessen the "heavy feeling" so much complained of.

For the anorexia, tincture of nux vomica, condurango, calumba or quassia, with compound tincture of gentian or cinchona as a vehicle, will often sharpen an indifferent appetite if given a short time before meals.

In anemic or cachectic conditions the various ferruginous preparations are indicated, as well as cod-liver oil, olive oil, or official preparations of the hypophosphites.

A malarial complication, often present, either openly or latently, will require the addition of quinine, which may be administered in the most eligible form.

Constipation, when present, may be controlled by castor oil or enemas, drastic cathartics being inadmissible. In these infrequent cases of constipation in pellagra an injection of 2 to 4 ounces of cotton-seed or olive oil, introduced into the rectum on retiring and kept in all night, will generally produce a soft, unirritating and effectual evacuation of the bowels the next morning. The writer is also employing, with good results, the liquid paraffin, given as required—generally a tablespoonful night and morning. Mention might also be made of phenolphthalein, which, in 1- or 2-grain doses at night, is followed by satisfactory movements.

The symptoms of nervous irritation, expressed by burning hands, feet, or mouth, will often tax to the utmost the resources of the physician. These may be combated by compresses saturated with a mild solution of bichloride of mercury, ice cold, and applied at frequent intervals; by baths in hot mustard water or slightly mentholated applications of liquid albolene. In occasional instances this burning becomes so intolerable as to require an anodyne.

The aches and shooting pains may often be alleviated by 5-grain doses of acetylsalicylic acid, given four times daily. This sometimes burns the stomach, but not often. Phenacetine, to which is added a small amount of citrate of caffeine, may also be employed for the headache or the different neuralgias. Massage in some instances affords decided relief in muscular pains, and the rubbing in of a gently stimulating liniment is not amiss.

The erythema, being a secondary symptom, should receive only palliative treatment. Too many applications tend to irri-

tate more than soothe, and too many ointments can sometimes transform a dry erythema into a moist one, which is far from being desirable.

While the hands are red and hot, a lotion, as suggested by Dr. Babcock, is serviceable:

Pulv. calamine, 4 drachms;
Pulv. zinc oxide, 3 drachms;
Rose water, 2 ounces;
Lime water, to make 1 pint.
This may be applied ad libitum.

After desquamation begins, there are several mild ointments available.

The writer has used with satisfaction the 5-per-cent boric acid ointment. Dr. Babcock recommends:

Pulv. calamine, ½ drachm;
Zinc oxide, ½ drachm;
Olive oil, 1 drachm;
Lanolin, to make 1 ounce.

Gentle cleansing of the scales or crusts, after having been softened with some oily substance, will promote the comfort of the patient.

When other applications to sore and crusted skin have failed, the writer recommends the scarlet-red ointment (Heilkraft). This may be applied once or twice daily and is quite efficacious. An objection to its use is the stain it produces upon any article it touches.

When the erythema attacks the eyelids and sympathetic conjunctivitis ensues, a weak solution of argyrol dropped in the eyes will generally prove adequate for relief.

For great exhaustion, the intravenous injection of saline solution (300 Cc.) every day or alternate day is suggested.

For the mental and psychic symptoms, appearing as they do in such multitudinous forms, only general suggestions can be made. To treat these manifestations by any rule of thumb would be irrational and fruitless.

Sleeplessness may be combated by chloral, trional, or veronal. By the addition of phenacetine to veronal the good effect is augmented and disagreeable after-effects prevented. Morphine or codeine for insomnia is to be deprecated.

Tincture of opium or powdered opium is useful for the melancholia, but the drug must be aided by isolation and rest.

When the mental symptoms deepen into the more pronounced forms of melancholia or lapse into dementia or amentia, the patient should be put in an institution for the mentally sick. These unfortunate invalids are subject to so many varying moods, suicidal and otherwise, that it is impracticable to properly and safely care for them at home.

While many of the pallagrous neuroses and psychoses are the result of degenerative changes, where scar tissue impedes and cuts off conduction, still, in many instances, if the treatment is persisted in with a spirit of optimism, unexpected improvement may brighten a gloomy prognosis and light may emerge from sad obscurity.

We are not as yet thoroughly conversant with the influences of the mind over metabolic processes upward or downward, and while due caution should always be observed in any predictions, no one man nor set of men are privileged to abrogate the function of a supreme court by asserting that pellagra is an incurable disease, and that medical treatment is valueless.

PERFORATION OF THE NASAL SEPTUM DUE TO THE INHALATION OF ARSENIC TRIOXIDE.

Davis in the *Journal of the American Medical Association* of June 2, 1917, says that perforation of the septum due to exposure to the salts of arsenic—the fumes produce systemic but not local effects—appears to be quite common, but the literature is scanty. Our knowledge of this condition is thus summarized by Kober and Hanson:

The most characteristic lesion produced on the upper air-passage is perforation of the septum of the nose varying in extent from a circular hole one-eighth to one inch in diameter. Perforation may be complete in a month from the time of commencement of work. The anterior and lower margin of the cartilage and the bones to which they are attached never become involved in the ulcerative process, so that deformity is absent, thus distinguishing the condition

easily from that due to syphilis. Once the perforation is complete no further inconvenience is felt; not a few of the workers are ignorant of the existence of the condition.

The effects of the perforation are negligible. The ulceration ceases when the limits of the cartilaginous septum have been reached and the edges heal over. Bamberger says that elderly persons and snuff-takers are less liable to perforation of the septum than are the young and those who do not use snuff. Mitchell says that nothing that has yet been done has served to diminish the frequency of perforation of the septum. The inconvenience caused by the lesion does not seem to be sufficient to induce men to make trial of such expedients as plugs of cotton-wool in their nostrils or, as has been proposed, painting the septum with paraffin. In short, preventive measures resolve themselves into the suppression or removal of dust and fumes, attention to cuts and abrasions, periodic medical supervision, and cleanliness.

The lesion in the nasal septum of chrome workers appears to be quite analogous in its development and course to that produced by arsenic trioxide in the two cases described in this report.

A METHOD OF TREATMENT OF MERCURIC CHLORIDE POISONING.

Weiss in the *Journal of the American Medical Association* of June 2, 1917, states that in bichloride poisoning he gives alkali, hypertonic salt solution by mouth, by rectum, and intravenously. Freyhof and Weiss have modified the old English potus imperialis. This modification, which they call "imperial drink," consists of potassium bitartrate, 60 grains; sodium citrate, 30 grains; sugar, 60 grains, with lemon or orange juice to taste, to 8 ounces of water. This makes a pleasant alkaline drink, which is best made by placing the potassium bitartrate and sodium citrate in the lemonade just before it is used. In conjunction with this, Weiss uses intravenous injections of Fischer's solution, which consists of sodium carbonate crystals, 10 gm., and sodium chloride, 15 gm., to 1000 Cc. of water.

The treatment begins on the arrival of the patient, which is usually within a few hours after the drug has been taken. The stomach is washed with 1 quart of milk and the whites of three eggs, followed by water. A sample of gastric contents is saved for examination. Before the stomach tube is removed, 3 ounces of magnesium sulphate in 6 ounces of water are introduced and allowed to remain in the stomach. The patient is then given a soap-suds enema. The enema and catharsis rapidly open the gastrointestinal tract, thereby aiding in the elimination of mercury. If the patient does not vomit immediately after swallowing the poison and does not reach medical aid for at least three hours later, an intravenous injection of Fischer's solution is given at once in amount ranging from 1000 to 1500 Cc., depending on the condition of the heart of the patient. If there is no evidence of cardiac derangement, 1500 Cc. of fluid intravenously are readily tolerated without any disturbance. Then the patient receives from six to eight glasses of imperial drink a day, and he is given large quantities of water by mouth. He is allowed a liberal diet—almost anything except an excess of protein foods.

Weiss uses the analysis of the urine as the control of the treatment. The patient should void large quantities of urine, as he is taking large amounts of fluid. He endeavors to keep the urine alkaline to a saturated solution of methyl red in alcohol, for Fischer has shown that if the urine of a nephritic cannot be made alkaline to methyl red, this patient continues in a dangerous state. An animal poisoned with mercury is at least a potential, if not an actual, nephritic. Almost all of the patients develop an albuminuria early, but this gradually, or occasionally rapidly, disappears, as soon as sufficient alkali can be introduced into the body to counteract the abnormal amount of acids produced.

Weiss has had complications in only one patient; he developed a severe necrosis of the mucous membrane of both sides of the

cheek, and later in the course of the disease he had severe intestinal hemorrhages, in all probability from the colitis produced by the mercury excreted through the bowel. Similar cases were described by Lambert and Patterson.

Up to the present time Weiss reports fifteen cases personally treated and ten cases similarly treated in other parts of the hospital. The series began in July, 1915, and continues to the present time.

These twenty-five patients were discharged from the hospital, free from any discoverable symptoms of mercurial poisoning. There were no fatalities. The amounts taken by these patients, according to their own statements, varied from 3 to 82 grains of mercuric chloride, all taken by mouth.

OXYGEN MINE RESCUE APPARATUS AND PHYSIOLOGICAL EFFECTS ON USERS.

In Technical Paper No. 82 of the Department of the Interior, HENDERSON and PAUL report on this topic. They state that what is desirable in the way of change in the forms of apparatus hitherto in use is not that they should be made all alike, but rather that each should retain those features in which it excels and should be improved in those in which it is defective. To this end the following recommendations are offered:

1. The helmet of the type used with the Draeger and the Westfalia apparatus should be entirely discarded. Any device of this type which may be invented in the future should have a dead space of not over 200 Cc. and should be tested with the utmost care as to its tightness upon the face.

2. A self-adjusting oxygen feed valve should replace the fixed feed valve now used. Whenever the fixed feed valve is usd it should be set to a flow of not less than 3000 Cc. as a minimum per minute, measured at a temperature of 60° F. and a barometic pressure of 30 inches of mercury.

3. The arrangement for artificial circulation in the Draeger and the Westfalia apparatus should be eliminated and replaced by a natural circulation. When the Draeger and Westfalia are used in their present forms the automatic circulation should not be less than 75 liters per minute. The injector should be placed between the exhalation bag and the absorber so as to decrease to the smallest possible limits the area in which a negative pressure occurs.

4. The weight of the entire apparatus should not be in excess of 35 pounds.

5. The absorption of carbon dioxide should be so nearly complete that the air in the circulation system during moderate exercise will not contain more than 0.5 per cent of carbon dioxide, and at no time, even during the most vigorous exercise, more than one per cent. The absorber should be capable of fixing at least 2.5 liters of carbon dioxide per minute.

6. A by-pass valve should be made a part of the apparatus, to be used in case of failure of the reducing valve, for refilling the breathing bag should it be pressed flat, and for renewing the air contained in it in the event of poor absorption of carbon dioxide.

7. An automatic relief valve should be provided that can also be operated by the hand or finger. It should be placed on the exhalation bag.

8. The inhalation and exhalation bags should have a combined capacity of at least 8 liters. If a single breathing bag is used, it should have a capacity of at least 5 liters.

9. The breathing bags should be protected against accidental compression when the wearer is crawling through a low passageway.

10. The air within the circulating system should at all points be under a positive pressure of not to exceed 1 centimeter water gauge, to insure that any leakage that may occur shall be outward and not inward.

11. All tubes and valves should be sufficiently large to permit the breathing of 100 liters of air per minute without undue resistance, with a positive pressure not to exceed 5 centimeters water gauge, and no

negative pressure even during the deepest and most rapid breathing.

12. Pressure gauges should be regularly tested in comparison with a standard instrument. They should be calibrated in atmospheres and also in minutes of duration of the remaining oxygen supply, and should be placed where the wearer can easily see them, or provided with some device that will warn him when the supply is nearly exhausted.

13. Couplings and connections should be reduced to the smallest number possible and made strong enough so that even a heavy blow will not dislodge them, cause them to leak, or compress them so that air cannot pass freely through them.

14. The production of heat in the absorber should be reduced to a minimum, and an efficient radiating or cooling device provided.

15. Parts of the apparatus worn on the back should be protected against damage when the wearer is traveling under a low roof. The valve regulating oxygen supply, which in some forms of apparatus now projects to the side, should be protected against accidental closing.

16. In addition to training in a smoke chamber, as now practiced, men who are to take part in mine rescue operations should also be required, while wearing apparatus with full service equipment, to walk or run for ten or fifteen minutes at a pace of five miles an hour, and two hours or more at a varied pace, as herein described. These tests should be made a regular part of the drill and examination of men engaged or liable to be engaged in rescue work. The capacity of each man to sustain the physical effort necessary should also be carefully determined in the manner herein described.

17. Experiments such as those herein described on the effects of carbon dioxide on the resting person, and on the effects of insufficient oxygen or excess nitrogen without considerable increase of carbon dioxide, may also be profitably demonstrated to men under training. It is important for their own safety that men who are to take part in rescue work should clearly understand the various forms of asphyxia and the premonitory symptoms of each. Such demonstrations should, however, be carefully supervised, as they are otherwise quite dangerous.

THE TREATMENT OF BRONCHIAL ASTHMA BY VACCINES, WITH REPORT OF CASES.

In the *American Journal of the Medical Sciences* for June, 1917, SICARD asserts that asthma is undoubtedly in some cases an expression of anaphylaxis; clinically it resembles the hypersusceptibility produced in animals by the injection of foreign proteid. Patients with this disease become sensitized to some form of proteid by absorption from the nasal mucous membrane, alimentary canal, or from some focus of infection, and react with an attack of bronchial asthma upon an intoxicating dose of the poison (Meltzer). Babcock recalls the case of a sufferer from asthma who was operated upon for gall-stones, with relief of the asthma, and as long as drainage of the gall-bladder was maintained there was no asthma, but with stoppage of drainage it returned; finally, with cure of the gall-bladder the asthma disappeared. Likewise the removal of nasal polyps restores drainage to the accessory sinuses of the nose and relieves a pent-up focus of absorption which has been causing attacks; the removal of hypertrophied turbinates acts in the same way. In some cases the smell of horses or of the stable in a sensitized individual will bring on an attack. Sometimes the injection of horse serum in the form of antitoxin will produce an attack; a friend of Sicard who received a small immunizing dose of diphtheria antitoxin had such a severe anaphylactic reaction with asthma that his life was despaired of. Asthmatic attacks occurring with hay-fever, and due to the pollen of ragweed, goldenrod, etc., are of the same origin; inoculation with constantly increasing emulsions of these pollens, or polyvalent emulsions, will cure or improve the attacks. Egg proteid also causes attacks in some

individuals. Sicard has in mind a child who had asthmatic attacks after eating eggs, and which attacks cleared up after a change in diet. The urticaria following the ingestion of fish is of the same character; likewise the urticaria following the injection of antitoxin.

Another source of attack (and one with which Sicard has been working) is due to the presence of bacteria, primarily streptococcus viridans or streptococcus hemolyticus, secondarily micrococcus catarrhalis. These cases are obviously infective, and the more asthma Sicard sees the larger he thinks this group is; they occur with bronchitis, and sometimes run an acute course with febrile reaction, increase in pulse-rate, cough, and sputum, and are often followed by emphysema.

If the sputum be collected in a sterile cup or Petri dish, washed, and a loop stirred in blood agar and poured in a Petri dish, and later streaked on North's medium, streptococcus can practically always be grown. Whatever the variety of germ, whether streptococcus viridans or streptococcus hemolyticus, an autogenous vaccine will cure the attacks. It is best given twice a week, in constantly increasing strength, for twelve to twenty injections. It is much better to give such dosage that local reaction occurs, although Sicard has had cures in patients who showed no local reaction. On the other hand he has had cases which showed no improvement until doses were given in sufficient quantity to cause local reaction. He has adopted the practice of beginning with 100,000,000 in adults and feeling his way cautiously until finding the dose that caused local reaction, and then provoking a local reaction on every injection. If at any time the local reaction be too severe, or if general symptoms occur in the form of fever, chilliness, general malaise or aches, or increase in the asthma, he allows a rest for a period before beginning again, using his judgment as to continuing the same dosage or dropping back to a smaller one; it is better to avoid going backward if possible. One thousand million is often far enough to carry them, although more obstinate cases may require 2000 million, and Sicard has carried them to 3000 million and higher. It is very striking to see the asthma clear up after the first injection, as has happened in a number of Sicard's cases. The longest period of cure he has to report is two years. He has been struck with the fact that streptococcus seems to be the chief offender. He has had no pneumococcus cases. Micrococcus catarrhalis, he is convinced, is usually a mouth infection in asthma. He does not find it often in sputum that is carefully washed, and when the specimen for culture is carefully selected. Vaccination by catarrhalis seems to have had very little action on the asthmatic attacks when mixed infection is present. Babcock reports excellent results in a case of mixed infection, in which he used a mixed vaccine of pneumococcus, streptococcus, and an anaerobic bacillus. After inoculation for a time at semiweekly intervals it is usually advisable to make the intervals weekly.

ARTHRITIS DEFORMANS AS AN INFECTIOUS DISEASE.

In the *Journal of Medical Research* for May, 1917, NATHAN states that for clinical and especially therapeutic purposes we must consider this disease from its general and local aspect. Thus the presence of symptoms of general infection, the metastases in other organs besides the joints, the recurrences and the location of the primary focus must be considered as a problem separate from the articular disease.

In this regard a word of caution is indicated. Though it is not unlikely that a focus in a tooth is sometimes and one in the throat is often the point of entry for bacteria, it should be remembered that once the microörganism has entered the blood its connection with the portal of entry ceases. For this reason, though the removal of the affected tooth or tonsils will, if these are really the site of the original focus (which is not by any means always certain even when they are abnormal), prevent reinfection or recurrences, such procedures

have absolutely no influence upon the joint condition as it already exists. Nathan is afraid that this fact is seldom made clear to patients who are persuaded to resort to surgical measures in these organs. Moreover, it must be remembered that a focus in the joint structures, like a focus anywhere else, besides causing local changes, may be and no doubt often is a source of general infection and metastases.

The local articular conditions must be divided into active and terminal stages. The active stage may be short and terminate in complete resolution, or it may last a very long time; that is, it may be chronic. In the chronic conditions it is often of importance, in view of the treatment, to differentiate between epiphyseal and subperiosteal and synovial forms of disease.

In the final stage the terminal condition to be met with is more or less readily differentiated by the objective signs and the radiograph. Thus we can often distinguish between degenerations without loss of passive motion and more or less deformity (dislocation, etc.), fibrous ankylosis, bony ankylosis. It should be remembered that these changes are not typical of a certain class of cases, but may and do occur simultaneously in different joints in the same individual. Finally the presence of concomitant central or peripheral neural involvement must be determined.

When the fact that the joint condition—either non-articular or polyarticular—may remain active and progressive though the general condition has subsided, that the local joint condition varies according to the virulence (but not the cause of the infection), the termination, the mechanical conditions in the joint and the concomitant conditions, there need no longer be any difficulty in understanding and caring for the so-called rheumatoid polyarthritides.

In conclusion Nathan has only a few words to say as regards the treatment of the conditions here discussed. Some years ago he strongly advocated the use of thymus extract in the treatment of these diseases. At that time he stated that this substance is not specific. The fact nevertheless remains that thymus seems to have a very definite beneficial effect upon the nutrition, and Nathan still finds that in those cases in which the joints are not destroyed or ankylosed (providing it is long continued and the routine dieting and mechanical treatment which are so harmful are omitted), it nearly always leads to more or less complete recovery.

When the mechanical functions of the joints are impaired the problem becomes a mechanical one, depending upon the mechanical conditions not only in each case, but in each joint.

POSTOPERATIVE PARALYTIC ILEUS.

FOWLER in *Colorado Medicine* for May, 1917, states that the treatment for postoperative gas should be instituted early, including enemas, hot stupes to the belly, eserine 1/100 to 1/50 grain, and pituitrin 1 Cc. each hour for three or four hours, unless it has a bad effect upon the heart. Goth recommends physostigmine salicylate 1/64 to 1/32 of a grain, digalen 15 minims each three hours, strychnine grain 1/30 to 1/15 each three hours, and caffeine sodium benzoate grains 2 each three hours, these last three alternating one each hour to support the heart. Cathartics are useless and perhaps damaging. Gastric lavage hourly or every two or three hours is indicated, but the best of all is large quantities of water both by bowel and by hypodermoclysis, ten to sixteen pints each twenty-four hours. Bonney suggests adding one ounce of brandy to each quart of saline infusion.

If the above medical measures fail to give relief within twelve to eighteen hours after instituting them, or if the patient gets worse in the meantime, then resort must be had to surgery without further "ifs" and "ands" of a continued waiting policy. The paralyzed gut must be drained at once to save the patient; and when one knows that this operation was successfully done in 1787 by Renault following the suggestion of Louis in 1757, and was later revived by Nélaton in 1840, we should not hesitate to

undertake it for the want of sufficient precedent or for the lack of the stamp of age upon it.

As to the method of surgical attack we have the choice of several procedures that have been done and advocated by various surgeons. One may, as suggested and used by Thompson, perform an anastomosis between any loop of dilated gut that one happens to pick up and the ileum just before the entrance to the cecum, or this combined with an appendicostomy or a cecostomy; altogether, Fowler thinks, entirely too large an operation to be satisfactorily used in these desperate cases. One may also do an anastomosis between any portion of the dilated gut and any portion of the large intestine, preferably, he thinks, the sigmoid. If the cecum is dilated along with the small intestine, then one may do a cecostomy, as used by Victor Bonney, but Fowler believes that by far the best procedure to undertake is the easiest and simplest of all, and will be more likely to get the patient over the present dangerous condition, and that is to simply bring a loop of dilated gut to the skin, endeavoring to get a loop as high as possible, for it is important to get drainage as near the duodenum as one can, for this has been aptly called by Bonney "the reservoir of toxicity." This measure is upheld by McKenna, Whipple, Bernheim, Stone, and others. After the gut is brought to the surface and opened immediately after suture to the peritoneum, a tube is passed into the gut in both directions for drainage of both gas and fluids and also to irrigate the intestine with salt solution. McKenna says this operation should always be done under local anesthesia. Bonney reports one hundred per cent of recoveries in his five cases, and asserts that no patient with fecal vomiting should be allowed to die for the want of this operation. "Its effect in my cases," he says, "has been remarkable; in all of them there has been an immediate cessation of the vomiting, and all the patients have recovered."

This, of course, requires a later operation within a few weeks to correct the fistula. The people may criticize us on account of this later operation, but when one considers that a live candidate for a second operation is of so much more value than a patient dead for the want of a fistula of the jejunum, one will have little hesitancy in urging such an operation in these extremely serious cases. Hicks claims that all one needs to do is to stir up the intestines in these cases and to wash out the peritoneal cavity.

The incision should be made upon the left side of the belly, as here you are more likely to pick up the jejunum within a reasonable distance from the duodenum so that the "reservoir of toxicity" may be better drained.

Recovery of the tone of the intestine comes on quite suddenly, within a few to several hours after operation, and in two of Fowler's cases treated medically tone was regained completely in the course of several hours after recovery really began.

Fowler concludes as follows:

1. The diagnosis can only be made exactly with the *x*-ray, and its aid should be invoked in every case of suspected dilated stomach or intestinal paresis.

2. Operation must be done early to obtain the best results in this very serious complication.

3. The simplest, easiest, and quickest operation should be done, and it must be done under local anesthesia.

4. The vomiting (gulping) and the pulse are the best guides to follow as to when to operate. The patient's statements, that he feels fine, etc., are misleading.

INTRAVENOUS GLUCOSE INJECTIONS IN INFANCY.

DUNN, in the *American Journal of Diseases of Children* for July, 1917, from certain experiences and experiments believes such injections may prove very useful. He points out that the principal difficulty attending intravenous injections and transfusion in young infants has always been a technical one, due to the extremely small size of the veins. The suggestion of

Helmholtz, that in hemorrhagic disease of the new-born transfusion could be more easily performed by using the longitudinal sinus, appears to be of the greatest importance in this connection. The longitudinal sinus in the infant is a large vein easily accessible through the open fontanelle. If the employment of this route in performing transfusion avoids the principal technical difficulty, it is available, not only for transfusion in hemorrhagic disease of the new-born, but also for the giving of intravenous injections and medication. That certain forms of medication, as well as the giving of fluid for the purpose of stimulation or of supplying loss to the blood, are best given directly into the blood itself, rather than by mouth or by the subcutaneous route, has long been recognized. This is particularly true when it is desired to give a normal salt solution, or circulatory stimulants, in certain infants in whom the condition is such that absorption from the skin takes place with great difficulty. Such a condition is seen in many cases of extreme atrophy and inanition.

Dunn has adopted the use of the longitudinal sinus for obtaining blood for the Wassermann reaction and for giving intravenous injections. The technique has proved to be extremely simple and apparently entirely free from danger, except perhaps when salvarsan is used. He has used the longitudinal sinus for the giving of normal salt solution, of sodium bicarbonate in acidosis, of antitoxin in diphtheria, of circulatory stimulant drugs, and of solutions of glucose. It is the glucose injections which are considered in this paper.

The cases in which the intravenous injection of glucose was used were all of approximately the same type. They were cases of a condition well known to all pediatrists, showing extreme atrophy and inanition produced by various forms of gastrointestinal disease. Such cases are commonly admitted to the hospital in a moribund condition, especially in the summer and autumn months. Other cases are in less immediate serious condition when first admitted, but go down-hill rapidly in spite of all available therapeutic resources. In the treatment of these cases, in addition to the regular dietetic treatment of the underlying gastrointestinal disability, Dunn has such measures as the checking of excessive watery diarrhea with loss of salts by means of opium, the counteracting of a relative acidosis by the giving of sodium bicarbonate, and the giving of fluid by rectum or subcutaneously to supply loss and as a circulatory stimulant. All the cases reported in the present series were of infants who were either admitted to the hospital in an acutely moribund condition, or who after admission became steadily worse under all the ordinary methods of treatment.

The theoretical basis for the use of intravenous glucose injections in such cases is that apparently the vicious circle produced by gastrointestinal disorder has become so extreme that the digestion and absorption of sufficient food to furnish the energy requirement of the body is impossible. Necropsies in such cases seldom reveal lesions of a character sufficiently pronounced to be considered the cause of death. We can hardly assume that death is produced either by lack of fuel or by the accumulation of the toxic products of a metabolism disordered by the lack of fuel. Glucose is the only food substance which exists outside the body in the same form in which it circulates in the blood and is utilized by the tissues. All other food substances must go through the complicated processes of digestion and alimentary absorption before they can be used. Consequently, it seemed that the injection of glucose directly into the blood in these cases might, through a temporary supply of even a small quantity of fuel, break the vicious circle for a length of time sufficient to permit improvement of the condition to take place.

The technique which he used is very simple. A syringe sufficiently large to hold the entire quantity of fluid to be given is connected with the needle by means of flexible rubber tubing. There is a glass

window in the tubing just above the needle. The needle is of small size, such as is used for lumbar punctures in infants, slightly larger than an antitoxin needle. The entire apparatus is sterilized, and the syringe is filled with a sterile 5-per-cent glucose solution. After expulsion of any air which may be in the tube, the needle is entered at the posterior angle of the fontanelle. Three persons are required to give the injection: one to steady the infant's head, one to manipulate the needle, and one to manage the syringe. The entrance of the needle into the sinus is accompanied by a sudden lessening of resistance. The piston of the syringe is then slightly and slowly withdrawn until blood appears at the glass window. As soon as the appearance of blood shows that the needle is actually in the sinus, the movement is reversed and the glucose injected very slowly, the assistant holding the needle firmly in place. Dunn has adopted the use of a syringe rather than the use of the gravity method, because with the syringe and glass window one can make sure that the injection is actually going into the sinus. He has found no objection to the use of the syringe if the injection is given very slowly. A sign of too rapid injection of the fluid is distention of the superficial veins of the scalp. No accidents or unfavorable effects which could in any way be attributed to the intravenous injections have been observed with glucose solutions.

In determining the quantity of glucose to be injected, Dunn rather arbitrarily adopted a 5-per-cent solution. He is inclined to think, however, that he will try somewhat stronger solutions in the future. The quantity of the solution to be injected depends on the quantity of fluid which it is safe to inject into the infant's circulation. This, of course, is not definitely known, and Dunn was obliged to adopt arbitrary rule. He began with a quantity of fluid approximately equal to one-fourth of the estimated blood volume of the infant. As this quantity of fluid appeared to produce no bad results of any kind, it was adopted as the standard for intravenous injections. The blood volume is estimated at approximately one-fifteenth of the body weight, and therefore in choosing the quantity of glucose solution for intravenous administration to a baby, one-sixtieth of the body weight is taken. The quantity of glucose given, therefore, varies with the body weight of the infant. With 5-per-cent solutions, it lies between 1 gm. as a minimum, which would be contained in 22 Cc. of fluid, and would be suitable for a baby weighing 1320 gm., and 12 gm. of glucose, which would be contained in 240 Cc. of fluid, and would be suitable for a baby weighing 14,400 gm.

In eighteen cases the records are sufficiently complete to make them available for the purpose of this report. Dunn does not wish to imply, however, that these cases are presented in statistical form as proof of benefit from the injections. Clinical evidence of improvement with any therapeutic procedure of this kind is very uncertain and can never be accepted as proof. Nevertheless in some of the cases the improvement which followed the injections was so immediate and so striking that it seems to him that there is a possibility at least that the injections produced a good effect. It must be remembered that all the cases were either actually moribund or were of a type in which all other measures had failed, and in which a fatal ending seemed imminent. Of the eighteen cases in which this treatment was used, thirteen died and five recovered. After the injections, seven cases showed no improvement, five cases showed a slight temporary improvement, and six cases showed a striking improvement immediately following the injections. There is no evidence that the improvement, even if it was due to the intravenous injection, was caused by the glucose. The giving of fluid into the circulation in cases of this character is a therapeutic procedure of known value, and it is quite possible that the apparent improvement was due to the fluid given and not to the glucose.

Dunn has not on record a sufficient number of control cases in which normal saline

solution was given intravenously instead of glucose to present any evidence on this point. Even if he had such a series of control cases, the evidence would not be of much value in pointing to the glucose as the cause of improvement. There is, however, sufficient possibility of the improvement being due to this therapeutic procedure to warrant its further trial.

[If this plan is tried great care should be taken that the water used is not only sterile but freshly distilled, in order to avoid the so-called "water reaction."—ED.]

THE VALUE OF THE VON PIRQUET TEST AS CONTROLLED BY NECROPSY FINDINGS.

In the *American Journal of Diseases of Children* for July, 1917, KNOX makes a report on this subject. He says, as a result of his studies, that it may be concluded that the cutaneous test with tuberculin, as described by von Pirquet, is a most reliable aid in the detection of tuberculosis in children; that a positive reaction indicates invariably a tuberculous focus in the body; and that a persistently negative reaction establishes the fact that there is no tuberculous lesion except in those extremely ill patients in whom the presence of tuberculosis can be readily established by physical examination.

TREATMENT OF DISEASED NASAL SINUSES BY THE GENERAL PRACTITIONER.

FERGUSON in the *New York Medical Journal* of May 26, 1917, first reminds us that the ethmoidal labyrinth is made up of a series of delicate cells placed between the middle turbinate and the inner wall of the orbit, and extends anteriorly from the nasal process of the superior maxillary backward to the sphenoid body. The anterior cells drain into the middle meatus, the posterior cells into the nasopharynx.

The frontal sinus, really a high ethmoid cell, the outer wall of which forms the prominent supraorbital ridge, extends for a variable distance upward in the frontal bone and outward and backward over the roof of the orbit. Being divided by incomplete septa, it drains by a very small duct downward and backward under cover of the middle turbinate. The maxillary sinus or antrum of Highmore is placed in the body of the superior maxilla, and drains in an upward direction under cover of the middle turbinate and near the opening of the middle ethmoidal cells, so it can be readily understood that this sinus really is a receptacle for the overflow from the frontal and ethmoidal cells.

The sphenoidal sinus is of similar anatomical construction in that it is a single cell in the body of the sphenoid bone and also drains upward. It is placed opposite the posterior edge or face of the middle turbinate, and is another receptacle.

On examining the nose with reflected light nothing of these natural sinus openings is seen; only the middle turbinate bone curving downward, outward, and backward, like a small sail, is observed, completely obstructing the view. Therefore it can readily be understood that when infection of the ethmoid cells exists the resultant swelling simply blocks the exits of these sinuses and intense pain from retention results.

In acute ethmoiditis the patient may at first complain of a sensation of stuffiness or cold in the head, due to the catarrhal swelling of the middle turbinate. This produces negative pressure in the sinuses and excessive secretion from their lining membrane, creating a suitable soil for infectious germs. As soon as the disease is established the patient complains of intense frontal headache, a distinct feeling of block high up in the nose, dizziness on bending down, tenderness over the inner wall of the orbit and frontal bone, general malaise, chilliness, and some rise of temperature. The discharge is thick and creamy in character and, if the nasal spaces are fairly free, will be quite profuse; but if the nasal septum is deformed, most of the discharge

tends to the nasopharynx and the frontal pain will be very distressing.

What is to be done? Rest in bed, an initial dose of calomel followed by salines, and a light diet are indicated. Locally a spray of cocaine hydrochloride, two per cent, in a solution of adrenalin 1 to 10,000, should be used. This is used frequently throughout the day, followed by a spray of albolene until the acute symptoms have subsided. Where there is a severe blocking and the cocaine spray does not give relief, one may try some steam inhalations which will help to unload the engorged tissues and promote the flow. When the acute symptoms have subsided a twenty-per-cent solution of argyrol followed by a spray of medicated oil may be employed.

An acute ethmoiditis may be confined to the ethmoids or involve the frontal sinuses. In any case the maxillary antrum and sphenoid act as receptacles and invariably contain pus. However bad the picture may look, it is a comforting fact that the great majority of first attacks clear up very well under conservative treatment. The great danger is in neglected cases, and there are many who receive little or no treatment. These drift into a chronic state and are in constant danger from the possibility of aural infection, chronic laryngeal catarrhal inflammation, general systemic infections, and cerebral abscess.

Subacute and chronic cases are surgical propositions and belong to the rhinologist. In any patient who has gone through an attack of acute ethmoiditis and exhibits nasal deformities, such as septal deflections and spurs—predisposing factors to catarrhal sinuses—Ferguson would strongly recommend the removal of these by the submucous method, thereby possibly guarding the patient against future attacks, or at least securing such free drainage that, should an attack supervene, he is saved the intense pain and possible intracranial complications as well as the severe and radical ethmoid operation.

Although Ferguson has spoken of the sphenoid and antrum of Highmore as receptacles, he does not wish to convey the idea that they never become infected independently. The antrum may become infected through a tooth socket, and the sphenoid may, as the result of repeated nasal catarrh, have its resistance so reduced as to fall an easy prey to infection, endangering the optic nerve as it passes over the roof of the sinus, or the more serious complication of thrombus of the adjacent cavernous sinus.

One frequently is consulted for an annoying headache, the source of which seems baffling. In these cases a careful inspection of the nose may reveal a middle turbinate pressing tightly against the septum. The application of a little weak cocaine solution in adrenalin to the point of contact may clear up the headache and indicate the necessary steps for permanent relief; or, again, there may be nothing to indicate either block or pressure, but the anterior tip of the middle turbinate may have a granular or moth-eaten appearance. Here one is dealing with a latent ethmoid infection which, owing to the free drainage in the middle meatus, gives the patient no concern except at such times as he contracts an acute rhinitis, which stirs up the latent ethmoid, and he complains of a dull headache and troublesome nasal discharge. In these cases vaccines have been used with variable results; sufficient successes have been recorded to warrant a trial by people averse to operation.

TWO CASES OF SUDDEN DEATH AFTER KHARSIVAN INJECTION.

VASSALLO (*Practitioner*, March, 1917) notes that kharsivan is identical in essential particulars with the corresponding products of German manufacture. He states that death, although it followed the injection, was not due to the kharsivan because it occurred so rapidly that there was absolutely no time for the kharsivan to be absorbed.

The children upon whom injection was practiced were black and had yaws. One

also suffered from crap-pox. Three-tenths of a gm. of kharsivan was administered to each boy, in the gluteal region. The injections were freshly prepared from separate tubes. The rest of the tubes were given to other patients, who never showed any ill effects. Each patient walked out of the surgery, and a few minutes later dropped to the ground in a state of collapse. The first case died within fifteen minutes of the injection; the other within seventeen. Post-mortem examinations revealed no pathological clue as to the sudden cause of death. The stomach and intestines, particularly the small gut, were enormously distended. The author ascribes the deaths to shock.

THE EFFECT OF CASTRATION ON OSTEOMALACIA IN THE MALE.

ELLIOTT and NADLER (*American Journal of the Medical Sciences,* May, 1917) rightly observe that the cause of osteomalacia is not known. The disease has been attributed to infection, errors of nutrition, and perverted glandular function. Organisms have been isolated from the blood of patients and of animals suffering with a similar condition. Organisms isolated from the blood of white rats have reproduced malacia after injection into other rats. Feeding experiments have suggested the relation of errors of nutrition. The theory of perverted glandular function has been most supported, and much work has been done in the attempt to fix the responsibility of the various ductless glands. The ovaries, hypophysis, adrenals, thyroid, and parathyroids have been thought to play a rôle, singly or as a part of a polyglandular syndrome.

The loss of calcium and the softening of bone, together with a new production of bone poor in lime, are characteristic. There is a tendency to lime deposit elsewhere, as in the kidneys and bladder. McCrudden believes that osteomalacia is an exaggeration of a normal function, that the balance of bone metabolism is disturbed by excessive demands for calcium, as in pregnancies, bone tumors, and fractures. When bone catabolism exceeds anabolism the result is osteomalacia.

Treatment is empirical. Phosphorus, adrenalin, pituitrin, thyroid extract, arsenic, chloral, and chloroform narcosis have been among the remedies advocated. Since Fehling, in 1887, recommended castration in the treatment of osteomalacia in women, authors have reported as high as 80 per cent of cures following operation. Sterilization by Roentgen rays has proved beneficial. Results were best in puerperal cases, which often tended to recover spontaneously; nulliparæ were usually not benefited. Metabolic studies do not indicate that a mineral retention is produced after castration, as was supposed. Accordingly, many authors believe that the value of castration and sterilization lies only in the prevention of future pregnancies. Although castration of male cases has been advised in the hope of producing results comparable with those reported in female cases, no report of the operation has been found in the literature.

Five years after castration the case reported in this paper shows no actual improvement in bone structure. A probable remission has occurred, which may have been influenced by the operation. The result of castration in this patient would seem to indicate that osteomalacia is not a disease of the sexual glands.

THE END-RESULTS OF TREATMENT OF FRACTURE OF THE ELBOW.

NEUHOF and WOLF (*Boston Medical and Surgical Journal,* May 31, 1917) find a perfect end-result is one in which the normal range of motion is a sequel of the treatment of a fracture of the elbow. Anything short of this is termed an imperfect result. Of 13 cases treated by hyperflexion early mobilization and massage gave perfect results with moderate or marked displacement in 93.2 per cent; perfect results with slight to no displacement in 10 cases, 100 per cent. Thorough immobilization and massage without hyperflexion gave a perfect result, with moderate or marked

displacement, in 4 out of 10 cases; a perfect result with slight or no displacement in 12 out of 22 cases. Late mobilization and massage and without hyperflexion gave perfect results with moderate to marked displacement in one out of eight cases; perfect results with slight to no displacement in four out of thirteen cases.

Thus the clinical evidence is strongly in favor of treatment by reduction, hyperflexion, early mobilization, and massage.

SUPRAPUBIC CYSTOTOMY UNDER LOCAL ANESTHESIA.

BARNETT (*Urologic and Cutaneous Review*, April, 1917) states that he knows of no operation which will give so much in return as local anesthesia in suprapubic cystotomy when indicated.

Suprapubic drainage of the bladder is superior to urethral drainage if for no other reason than the fact that retention is practically impossible following suprapubic cystotomy, and the relation of danger between retention and non-retention is the relation between clean kidney pelves and renal tubuli, compared to infected ones on account of the distention carrying the infected urine up the ureters into the tubular portion of the kidneys.

Urethral drainage is unsatisfactory at best. The urethral catheter has laws of its own. No man knows after fixing the catheter in the bladder whether it will drain for two minutes or two weeks. There is no logic in its workings, and all laws of physics seem to be broken by the catheter's refusal to drain. One retention at this time will undo all the good that weeks of preparation have accomplished.

Urethral drainage will aggravate carcinomatous prostates so that a retention catheter is badly borne. Cancer occurs according to the most liberal estimate once in a little more than six cases; on the other hand the claim is made for its occurrence once in every four cases. The author's last ten prostatectomies showed, unfortunately for him, seven carcinomas. Suprapubic cystotomy under these circumstances would become a necessity, if not from choice.

Urethral drainage will predispose to epididymitis by pumping infection into the vasa through the utriculus masculinus (sinus pocularis) by way of the ejaculatory ducts.

The extra pus absorbed by the catheter trauma is shown frequently by the continued alkalinity of the urine. However, if this absorption is not too great it may be beneficial in helping to immunize the patient.

Hospital confinement seems to alkalinize urine. The writer's treatment after cystotomy is to send the patient home to his attending physician for preparatory treatment. Under home surroundings the renal function seems to improve more rapidly, and it is the rule to have the persistent alkalinity disappear.

The author's technique consists of one-per-cent cocaine solution injected subdermally in the linea alba or mesial line; after the skin anesthesia is finished, without removing the needle, the mesial line of the belly is injected (superficial, middle, and deep) with the one-per-cent cocaine solution, then the perimesial with 1:400 solution of novocaine. A one and one-half inch incision is made through the skin, between recti and pyramidales, then intraversalis fascia (assistant now fills bladder with saturated boric solution till it is rushing upon operator's finger). One-per-cent cocaine solution is injected into the bladder wall around site for puncture; now with slightly blunt scissors the perivesical fascia is opened, peritoneum pushed back, bladder wall pushed open with point of scissors to mucosa, then trocar and cannula plunged into bladder, trocar being removed to above drainage outlet of cannula. After the saturated boric acid solution has partly emptied, trocar is completely removed; Pezzer catheter on stilet and oiled is introduced into the bladder, after which the cannula is removed; a small cigarette drain is introduced in front and behind catheter down to bladder wall. No sutures are required; catheter is pulled

up till it is felt against the bladder wall. No leakage should occur around the catheter. The Pezzer catheter should be replaced by an ordinary catheter after seven days if phosphatic incrustations are felt on introducing the stilet.

SURGERY OF THE SPLEEN.

CALDWELL (*Southern Practitioner*, June, 1917) is inclined to class the splenomegalies as low-grade infections or toxemias. The finding of a pathological organism is quoted.

Surgery has been employed in the treatment of splenic enlargement from all causes, except the acute diseases associated with enlarged spleens, such as typhoid and typhus fever. Even hypertrophy, believed to be due to such diseases as malaria and syphilis, has, in a small number of cases, shown marked improvement after splenectomy, when medical measures failed to bring relief. It is for splenic hypertrophies that removal of the spleen is being employed most. Of course, tuberculosis, abscess, new growths, and injuries to the spleen have a definite foundation and indication for surgery. But the removal of the spleen for splenic anemia, hemolytic jaundice, the hypertrophic cirrhosis of Hanot, is employed because cures have been attained without knowing any reason for the satisfactory results. Splenic anemia is cured, or very greatly benefited, by the removal of the spleen, even in the rather late stages of the disease. The results obtained in hemolytic jaundice and Hanot's cirrhosis are not quite so satisfactory, but the results are such as to make the indication for surgery quite clear, in these conditions.

In the last few years splenectomy has been employed in an effort to at least control, if not cure, that dread disease, pernicious anemia. The early results obtained from splenectomy in these cases gave promise of great improvement in the treatment of pernicious anemia. However, the late results have been just as discouraging as the early ones were encouraging. It is remarkable how definite and uniform improvement is obtained in these cases after removal of the spleen. Seventy-five to ninety per cent of the cases surviving operation show immediate improvement in the clinical course, the blood picture maintaining many of the characteristics of pernicious anemia. While we recognize that the ordinary course of the disease is very bizarre, yet no other method of treatment has given such uniform improvement; hence we must attribute some definite influence to the surgery. Possibly, when we are able to properly select our cases of splenic anemia to be subjected to surgery, and also when we can supply surgery in an earlier stage, we may hope for more lasting improvement.

Mayo has observed that the cases of pernicious anemia, associated with definite splenic enlargement, derive the greatest benefit from splenectomy. The yellow type of pernicious anemia is suggestive of marked destruction of blood cells; the white, aplastic bone-marrow, which indicates different etiological factors, or at least involving different structures. This accounts for the greater improvement in the former type, which is associated with enlarged spleens. However, as the line of demarcation is so indefinite between the yellow type of pernicious anemia and acquired hemolytic jaundice, one may be easily mistaken in diagnosis, and the improvement be noted in the yellow type, because it was hemolytic jaundice and not true pernicious anemia.

As the boundary line between all the above-mentioned diseases, as well as certain forms of Hodgkin's disease, is so indefinite, any conclusions at which we might arrive must, of necessity, be indefinite. Banti himself acknowledged that splenic anemia, or Banti's disease, might be Hodgkin's disease of the spleen.

The author thinks that Krumbhaar sums up in a very concise and clear manner the indications for splenectomy in pernicious anemia in the following paragraph:

"In what cases of pernicious anemia

should splenectomy be undertaken? One of two lines may be followed, and it is as yet too early to say which, if either, is correct. If splenectomy merely induces a remission, and this at present is the opinion of the majority of observers, it should be logical to undertake it only as a last resort, when all other measures have proved unavailing, and only with the hope of prolonging life; even under such limitations, however, the procedure has already proved its value, and in several cases moribund patients have been brought back to life of comparative well-being for many months. Assuming, on the other hand, that an occasional patient may be, for practical purposes, cured of the disease, and giving due weight to the view that greater and longer continued improvement is obtained, if the operation is performed before the disease has reached its final stage, it would then be advisable to undertake it as soon as possible. Another factor that may prove to be decisive is whether or not increased hemolysis can be proved. In those cases with clinically enlarged spleens, icteroid appearance and increased urobilin output without increased resistance of the erythrocytes, the prognosis is distinctly more favorable than in the opposite types. The condition of the bone-marrow is also important, splenectomy being contraindicated if the bone-marrow is persistently aplastic. It has also been a matter of clinical observation that those individuals in whom spinal cord symtoms had already developed are less apt to be helped by the operation."

In a final report on fifteen cases operated at the Massachusetts General Hospital, only one was alive sixteen months after operation, and was in a serious relapse at this time.

W. J. Mayo takes a more optimistic view, while he gives no definite figures. He says: "But from our experience with nineteen patients, I feel justified in performing splenectomy in selected cases of pernicious anemia, and have at least the hope that, if it is done sufficiently early in the course of the disease, it will permanently check, if not cure, the condition." The only suggestion in the above as to what constitutes "selected cases" is the early cases.

Theoretically, at least, any measure that produces the immediate definite improvement that splenectomy does should have some real value. However, the value may be so meager that it is more than overbalanced by the mortality incident to the operation, which of necessity must be high, as any other major operation would be applied to such poor risks. In the reported cases that the writer has observed the low mortality is indeed surprising, not being any higher than splenectomy for any other condition. The mortality of splenectomy varies anywhere from 11 per cent (Mayo clinic), the lowest for any considerable number of cases, to 50 per cent.

WHOLE-SKIN GRAFTS AND CONTRACTURES.

DAVIS (*Surgery, Gynecology and Obstetrics,* July, 1917) notes that pedunculated flaps are especially valuable when fat is required in addition to the whole thickness of the skin. He holds that the graft of the whole thickness of the skin furnishes a most satisfactory solution of the whole graft problem.

The technique is as follows: If possible the part should be thoroughly massaged for some time before operation, as in this way the surrounding tissues are made more movable; the blood supply is improved, and better results are accomplished. All of the scar tissue should be excised if this can be done with safety, but in many instances the entire part is covered with scar, and in these only the contracture should be entirely excised, while the movable scar tissue beyond should be utilized. In contractures of the hand the author has found it best at this stage to apply a splint, previously prepared and sterilized. The splint should be padded with thick felt, and be so arranged that the fingers can be held in the desired degree of extension, either by loops of tape or by cotton glove fingers.

It is of the utmost importance that the raw surface on which the graft is placed be

perfectly dry. It is often difficult to check the oozing, and in some instances in which the bleeding cannot be stopped it is advisable to wait for a day or two before applying the graft. If the graft is placed on an oozing wound, the chances are that a blood-clot will form beneath it, and this will often seriously interfere with its new blood supply. If the graft is placed on a dry surface, it has the tendency to prevent further oozing, and if any bleeding should subsequently begin, it is usually localized in a comparatively small area, and can escape through the perforations in the graft or between the stitches.

Whole-thickness grafts may also be successfully placed on undisturbed, healthy granulations which are level with the skin edges. The grafts should be placed close to the growing edge, and to each other, if more than one is used. Whole-thickness grafts placed on dry granulations will adhere to them closely, and no sutures may be necessary. Grafts placed on granulations at first project above the surrounding skin, but later assume the proper level.

Shave the part selected, and wash with green soap and water. Rinse with sterile water. Sponge with ether followed by alcohol. Then rinse with normal salt solution, and dry with a sterile towel. From this point preserve an absolutely dry technique until the graft is in place.

Mark out lightly with a scalpel on the skin an elongated ellipse, bearing in mind that the edges of the wound caused by removal of the graft should be approximated with but little tension. Remove the skin with the underlying fat, down to the fascia or aponeurosis covering the muscle. As soon as the scalpel has penetrated the subcutaneous fat the skin immediately shrinks about two-thirds of its original size transversely, and a little less in its length, and this shrinkage must be planned for.

Wrap the graft in dry gauze until the wound from which it is taken is sutured and dressed. Then trim off all the fat from the graft with curved scissors. Perforate the graft in several places to allow the escape of any blood or secretions which may collect. Fit the graft into the defect, either in one piece or in several pieces, depending on the shape of the wound. If one piece can be used, it is advisable to secure it without tension by four cardinal sutures, preferably of horsehair. In some instances a continuous horsehair suture is used to fill in between the cardinal sutures, and in others a few interrupted sutures. The cardinal sutures should be through the full thickness of the graft, but the sutures between should be superficially placed, and should be as close to the edges of the graft and surrounding skin as possible. Occasionally no sutures at all are used as the graft adheres closely to the dry wound, but where no sutures are used it is advisable to secure the graft by means of rubberized mesh. A slight, even pressure should be exerted on the graft to hold it firmly against its base, but too much pressure should be avoided, as it interferes with the vitality of the graft.

The graft should be handled as little as possible, and the necessary handling should be most gentle. All of these points seem trivial, but on them depends the success or failure of this type of graft. A Thiersch graft may be handled with much less consideration and be successfully transplanted.

It is often advised in text-books to excise the scar tissue in one piece, and after excision to place it as a pattern on the skin and cut the graft by it, but this is not entirely practical, as the majority of scars are irregular in outline, and furthermore the scar itself shrinks after excision, and the graft after cutting shrinks; so little can be gained by this procedure. The author considers it essential that the wound from which the graft is taken should be closed at once and not left open, as would necessarily follow if an irregular-shaped piece of skin of any considerable size were removed. It is advisable to have the size and shape of the defect in mind when cutting the graft, but it will be found that a piece of whole-thickness skin after removal of the fat is very pliable, and can be easily fitted into irregular defects. It is better to have the graft too large than too small, and if the

defect is irregular, the graft may after removal be cut into the desired shape, or divided and pieced together. It is, of course, desirable to fill a defect with a single piece of skin, as there are fewer resulting scars, but this is often impossible.

Silver foil, dry gauze, moist salt gauze which is kept wet or which is allowed to dry out, are all excellent dressings. Another dressing which the author has found useful is a flexible paraffin mixture used by Carrel for another purpose. Any of these may be used with success, but none of them should be used exclusively, as the dressing should be chosen with regard to the surroundings of the wound grafted. For instance, it is more satisfactory to dress a graft used around the eye with moist salt gauze which is kept wet and often changed, as by this means the secretions from the eye are controlled, and there is less danger of infection, etc.

In children under ten years of age, in addition to the splint in hand and arm contractures, the author finds that it is always wise to put up the part in a plaster cast. If there are no contraindications, he does not disturb this cast for at least three weeks, and at the end of this period it will be found that either the graft has taken, or, in case of failure, the process of healing has proceeded with the part in good position. So in either case no time is lost. Another reason for keeping the cast on so long is that it is almost impossible to keep the part in the original position after once removing the dressing. This method of dressing children also insures immobilization, which is most important.

Except in young children, in whom plaster casts are indicated, it is well to keep the grafted area under constant observation, without disturbing the position of the part, which should be kept immobile until the blood supply is assured.

A general anesthetic is usually necessary in order to remove the contracture, and to prepare the wound for the graft. Advantage is always taken of this anesthetic to cut the graft, but whole-thickness grafts may easily be secured and successfully transplanted after nerve-blocking, or after outlining the area with a local anesthetic.

In whole-thickness grafts there may be practically no maceration of the superficial layers, while in some instances, on the other hand, only the corium may remain viable. Now and then an isolated section of a graft will lose its vitality through all its layers, and a patch of granulation tissue will appear. This area should be treated as any other granulating wound.

When the superficial layers are macerated and come away, either as a whole or in part, and the epithelization of the remaining corium is sluggish, it is desirable to scatter over these areas either epithelial scrapings or small superficial grafts including as far as possible only epithelium. These grafts take readily, and hasten the epithelization. The final result is excellent.

The result desired in whole-thickness grafting is elasticity, softness, movability, and normal color. Krause says that all of these are obtained in a third of full takes. In some instances a brown, irregular pigmentation may appear, but this is no more frequent than in areas grafted with thin grafts, so need not be particularly considered in cases of contracture in which function is more important than appearance. The graft may be cyanotic for some time, due to enlarged blood-vessels; later the surface of a graft may become irregularly shriveled. These changes in no way impair the efficacy of the graft, but must be borne in mind from the cosmetic standpoint and the possibility of these complications explained to the patient.

The histological changes in the healing process of a whole-thickness graft are, in general, similar to those which take place in healing of an ordinary clean wound. There is an exudation of fibrin from the surface upon which the graft is placed, which fixes the graft firmly in position. This fibrin layer is infiltrated by leucocytes and fibroblasts, and vascular sprouts soon begin to form and penetrate the corium, so that in a comparatively short time the graft is supplied with blood. These new vessels have been demonstrated by the injection

method in whole-thickness grafts on the third day. As early as the sixth day a whole-thickness graft on a fresh wound will bleed when cut. The author has obtained bleeding in eighty-four hours from a whole-thickness graft placed on healthy undisturbed granulations. The graft itself begins to take an active part in the healing process after the third or fourth day, there being marked proliferation of cells into the underlying exudation, and an outgrowth of new epithelial cells from the edges, from the ducts of the sweat glands, and from hair follicles. The elastic tissue of the graft degenerates and is replaced by newly formed tissue which probably develops, at least in part, from the preëxisting elements in the graft itself, as well as from the old fibers in the neighboring deeper tissues. A thin layer of adipose tissue develops under whole-thickness grafts denuded of fat in two to three weeks. This is most important, as it prevents to a large extent contracture and insures movability. The scar tissue beneath the graft continues to grow for several months. The newly grafted area must not be exposed too soon to irritation or trauma. It is difficult to guard against this until the nerve supply is reëstablished, as for the first few weeks the graft is without sensation. Within four or five weeks sensation begins to be restored to the transplanted skin, which gains tactile sensibility first, then pain, and last temperature sense. The nerve fibers undoubtedly grow in from the periphery, and not from the substratum, this being shown by the border sections always regaining sensation first. If the graft is large the central portion may, in some cases, remain less sensitive for a long time, but usually the sensation is entirely restored in the course of a few months.

In those cases of contracture in which the eyebrow has been destroyed, carefully shaped whole-thickness grafts of hairy skin from the pubis, with a thin layer of subcutaneous tissue, may be successfully transplanted, and will relieve the contracture, and at the same time form an eyebrow. In transplantation of skin from the pubis the direction of the hair growth should be kept in mind. Hair also grows on grafts taken from the thigh, or from any other hairy region. For this reason it is important to choose carefully the region from which the graft is taken.

AMPUTATION FROM THE ARTIFICIAL LIMB POINT OF VIEW.

OPENSHAW (*Lancet*, June 16, 1917) points out that one finger or the thumb of the natural hand is more useful than any apparatus. If there be left only the thumb or one finger, artificial fingers or an artificial thumb can be fitted, so that the patient has something to which he can oppose the remaining digit.

Amputation of the wrist-joint should not be done if it is at all possible to leave any portion of the hand, for it gives too long a stump for the proper application of an artificial hand. It is necessary to put the artificial wrist-joint at the end of the natural wrist-joint, and this brings the hand too far away from the elbow, and muscle power is lost.

In patients engaged in clerical pursuits, a new wrist-joint should be made by removal of one and a half inches of the radius and ulna, for to this an artificial hand can be fitted, so that the flexion and extension movements are converted into flexion of the interphalangeal joints of the index and middle fingers. The site for amputation of the forearm is one where the bones are divided at the lower end of the middle third of the forearm, for this gives a powerful useful stump, not too long, and capable of full pronation and supination.

A forearm stump where the ulna measures less than three and a half to four inches from the tip of the olecranon is often exceedingly difficult to fit with an artificial forearm bucket. The stump repeatedly slips out of the forearm bucket. As the supinator longus, the extensor muscles, and the flexors are useless, these should be removed in order to produce a flat surface upon which the upper and anterior edge of the forearm bucket can rest. If not more

than two inches of the ulna (measured from the tip of the olecranon) can be left, the amputation should be performed above the condyles of the humerus.

Amputation of the elbow-joint should never be performed as an operation of election, for it is difficult, though not impossible, to fit an artificial limb to an amputation such an amputation be performed the condyles must be removed, for if left it is impossible to accurately fit an arm-socket unless it be laced up the whole length of the front, which considerably weakens it.

The best site for amputation of the arm is one between a point one and a half inches above the elbow-joint on the one hand, and three inches below the fold of the axilla on the other, and an endeavor should always be made to divide the humerus between these two points.

With regard to the shoulder, it is easier to fit an artificial limb to an amputation where the head of the bone has been completely removed than it is to fit one to an amputation through the surgical neck of the humerus. It must be remembered that it is possible to fit an artificial limb to any amputation of the upper extremity.

At the shoulder-joint, by means of a molded leather cap, an artificial arm is adjusted to the body. Considerable space should be allowed between the arm and the chest wall by flattening the inner surface of the arm, so as to facilitate dressing. By adjustable straps and wires, the movements of the opposite shoulder can be utilized to bend the elbow of the artificial arm, and by a similar arrangement, passing round the chest and down the artificial arm to the thumb, the latter can be moved by abducting the opposite arm.

In amputations it is essential that the nerve trunks should be cut as short as possible and the ends of the stump should be covered with a loose movable non-adherent skin-flap.

With regard to the lower extremity, if the amputation has been of the digits and the bone is well covered with the scar on the dorsum, a boot can easily be fitted, and the patient walks well.

No skin-grafting of a granulating Chopart gives the least chance of a useful stump. The scar ultimately becomes the lowest part of the foot in consequence of the contraction of the tendo Achillis, and will not bear the weight of the body without ulceration.

Often a suppuration has followed a guillotine amputation performed through the center of the tarsus. A Syme is ultimately necessary, and should be resorted to early.

Neither a subastragaloid amputation nor a Pirogoff gives the most useful foot.

A Syme amputation is the best about the ankle-joint. It should be performed exactly as described by its originator, the malleoli and a layer of the tibia a quarter of an inch thick being removed. This gives room for a joint in the artificial foot itself instead of in the lateral steel supports. The amputation in the leg between the ankle-joint (Syme) and a point six inches below the top of the tibia must be looked upon as likely to give an unsatisfactory stump, and one which is, therefore, a tentative amputation. Such a method gives an unsatisfactory stump which is thinly covered, badly nourished, liable to blueness, anemia, ulceration, and sinus formation. It is only permissible as a temporary expedient.

The best amputation of the leg is one where the bone is cut four to five inches from the upper edge of the tibia, where the lower end of the tibia is square, and where it is well covered with healthy movable skin. A patient with such an amputation can carry a considerable part of the weight of his body on the end of the tibia, the remainder being borne by the lateral surface of the tibia and fibula and partly along the surface of the thigh.

After this amputation, with a well-fitting artificial limb, a patient can walk, run, and dance in such a way as to render it absolutely impossible, even for an expert, to decide which leg is artificial.

In this amputation the fibula ought to be cut half an inch shorter than the tibia, otherwise it seems to increase in length and to project. Should, however, the end of the tibia not be well covered with movable

skin the weight of the body cannot be borne on the end of the stump, and has to be carried on the lateral surface of the tibia and fibula, the sides of the thigh, and the tuber ischii.

It is imperative that in any amputation at the upper third of the leg the knee-joint should be kept straight, as flexion may render a further amputation necessary, either through the knee-joint or just above it. If the knee-joint is allowed to become flexed the hamstrings and the posterior ligament contract and shorten, and all these structures, even the posterior ligament, may require division; and even then it may be impossible to straighten the leg, and amputation at or above the knee-joint may be necessary.

Even one inch of the tibia, if well covered on the under surface, gives a more useful stump than an amputation through or above the knee-joint. The endeavor should always be made to divide the tibia in such a way and at such a point as to get a good covering for its cut surface. If this is not possible there will be a scar over the end of the tibia, and it is better to remove the tibia and the patella by some sort of incision similar to that for a Stephen Smith amputation.

In every Stephen Smith amputation the patella ought to be removed, for if left it retracts and forms a wobbling excrescence, which prevents the accurate fitting of a thigh bucket. It is quite easy to fit the leg after an amputation of the knee-joint.

A transcondylar amputation of the femur gives a very good stump. The periosteum should be pushed up and replaced over the edges of the divided bone. When the amputation is above the condyles, up to a point higher than the middle of the femur, the artificial leg should be made with a lacing bucket of leather, not wood. The tuber ischii should rest upon its upper edge, so that the patient's weight is transferred to the ground through the tuber ischii and partly through the friction of the skin against the inside of the bucket.

At or above the middle of the femur every amputation case should be fitted with a pelvic band, which should be accurately molded to the body before the steel is hardened. It should extend from just below the anterior superior spine on the affected side round the body below the iliac crests to the opposite anterior superior iliac spine. The hip-joint in this pelvic band should be at a point opposite the center of the great trochanter and half an inch above it. Such a pelvic band prevents the wobbling of the thigh and considerably improves the patient's gait.

Amputations in the upper third of the thigh, where the bone is divided at any point between the small trochanter and two inches below it, give a stump well-nigh impossible to fit with an artificial limb. If more than two inches of bone below the small trochanter cannot be left, then the femur should be divided at the small trochanter or through the great trochanter. It is easier to fit an artificial limb where the bone has been exarticulated at the hip-joint than it is where the bone has been divided through the great trochanter or at the small trochanter, so that if a long thigh stump cannot be made there need be no hesitation in removing the upper end of the femur, provided, of course, that the condition of the wound as to sepsis and of the patient will allow of this rather more severe proceeding.

INFECTION OF SIMPLE CLOSED FRACTURES.

BLAKE (*Boston Medical and Surgical Journal*, May 3, 1917) notes that in the past twenty years at the Boston City Hospital there were ten or twelve cases of infection of simple closed fractures; by this is meant an infection which parallels both in intensity and duration the infection which is still too common in compound or open fractures. The etiological factor is the entrance of bacteria through the skin either by a scratch or a hair follicle, or by the gateway of blebs and blisters; rarely through the circulating blood. Treatment is primarily preventive. It means more than the usual care in the cleansing of the skin of blebs and blisters; the latter may at

times contraindicate the immediate correction of fractures. When suppuration is evident, incision and drainage and the usual routine of the septic compound fracture treatment is obviously to be followed.

Scudder reported in this relation a case entering the hospital with a T-fracture of the lower end of the femur. It was decided to do an open reduction, but on attempting this, pus and blood were evacuated from the swollen tissues about the joint and from the joint itself. The patient subsequently perished.

Blake, referring to cases which were found to be infected at the time of late operation or at autopsy without sinus infection before this time, notes that it is possible that some cases of delayed union are complicated by what might be called a "silent infection."

GASTROJEJUNOSTOMY UNDER LOCAL ANESTHESIA IN THE TWO-STAGE OPERATION IN GASTRIC SURGERY.

Cheever (*Boston Medical and Surgical Journal*, May 3, 1917) notes that whenever possible, in two-stage operations, one or the other is carried out under some form of local anesthesia. He believes that certain surgical lesions of the stomach, or indeed of other organs, associated with or complicated by pyloric obstruction, furnish an ideal field for the two-stage operation, the first stage consisting of relief of the obstruction by gastrojejunostomy under local infiltration anesthesia. The technique employed has been of the simplest character. Cases 1 and 2 received a preliminary injection of 1/150 grain of scopolamine and 1/6 grain of morphine, the latter repeated just before the operation was begun; the remaining cases received ¼ grain of morphine half an hour beforehand; sometimes 1/6 grain was given during the operation, if prolonged. Anesthesia was always by infiltration with novocaine solution, usually 1 per cent, in two cases 5 per cent. At two points in the operation pain may be expected: first, when retraction is made to permit of inspection and palpation to determine the extent of the disease; second, when traction is made on the root of the transverse mesocolon preliminary to securing the loop of jejunum and to incising the mesocolon to enable the posterior surface of the stomach to be brought into the operative field.

The difficulty of satisfactory determination of the extent of the growth and of the presence of and extent of metastases constitutes the least satisfactory part of the operation, but is much obviated by careful infiltration of the parietal peritoneum about the wound. The actual performance of the anastomosis is painless, and the patient, exhausted by starvation and narcotized by morphine, sometimes falls asleep during it, to awake again when closure of the wound is begun, which is again aided by secondary infiltration of the peritoneum. The anastomosis is made by a vertical stoma, the posterior serous approximation by interrupted silk sutures, a posterior seromuscular continuous suture of No. 1 chromic gut, a second continuous suture of the same material approximating the mucous edge, and an anterior inverting Connell suture of No. 1 chromic gut, supported by interrupted mattress Lembert sutures of silk. In eight cases curved gastroenterostomy forceps were used; in two cases adhesions prevented their employment.

SPINAL ANESTHESIA.

Yount (*Surgery, Gynecology and Obstetrics*, July, 1917) on the basis of some 5000 cases, with but a single death, which occurred before spinal puncture and stovaine had been injected, notes that there are certain definite contraindications to spinal anesthesia which deserve careful consideration. Those based upon the physiological action of intraspinal anesthetics are most important.

As there is an almost constant drop in blood-pressure of varying degree, spinal anesthesia should not be used in cases in which there is marked hypotension from shock, hemorrhage, or any other cause.

Moderate hypotension need not be considered a contraindication except in operations on the upper abdomen or higher. Operations on the perineum, rectum, and lower extremities can be done safely even in the presence of marked hypotension, but special care is necessary in dosage and supportive measures. In exceptional cases in which spinal anesthesia would be considered the anesthetic of choice, in spite of the presence of marked hypotension operation could be safely done by giving continually, during the operation, normal saline containing adrenalin, intravenously. This procedure seems to combat successfully the usual drop in blood-pressure. The very old and asthenic individuals from long-continued illness seem to be unable to reëstablish their blood-pressure after a moderate drop. As a rule they should not be chosen for spinal anesthesia, unless the operation is below the level of the pubis and a very small dose can be used.

Cases in which there is marked interference with free cardiac action should not be chosen—*e.g.*, pericarditis, advanced myocarditis, mediastinal tumors and large pleuritic effusions displacing the heart. These cases almost invariably do badly under spinal anesthesia.

When the respirations are shallow and slow and the diaphragm plays an important rôle, spinal anesthesia is contraindicated in any condition which interferes markedly with diaphragmatic breathing—*i.e.*, extensive ascites, large intra-abdominal tumors, large pleuritic effusions, etc. This does not apply to operations below the pubis. There is one important exception to this general statement. In paralytic ileus after the injection of stovaine, the intestines tend to contract and the relaxation of the anal sphincter allows them to empty themselves so that the interference to respiration is quickly removed. This, of course, would not hold in mechanical obstruction.

Cases in which there is existing cerebrospinal disease should not be chosen unless there are other conditions present which render spinal anesthesia the anesthetic of choice.

It is dangerous to use spinal anesthesia when there is any likelihood of a convulsion occurring at the time of or shortly after injection—*i.e.*, eclampsia, tetanus, and hysteria. The author has observed one death which occurred in an eclamptic convulsion, in a woman who was given stovaine preparatory to doing Cæsarian section. If spinal anesthesia is especially indicated in any of these conditions, as it probably always is in eclampsia, measures should be taken to avoid the occurrence of convulsions at the time of operation.

Although stovaine has been used in children quite extensively it has not been found very satisfactory. Considerable difficulty is usually encountered in trying to effect lumbar puncture, due to resistance on the part of the patient. This may result in undue trauma to the cauda equina. The percentage of failures is higher than in adults, and on a few occasions it has been necessary to give a general anesthetic even with perfect anesthesia on account of extreme restlessness and nervousness. It is probably better to confine the use of spinal anesthesia to the selective field in children.

Extremely nervous individuals and those who are prejudiced against the method had better be excluded.

Marked deformity of the spinal column is not necessarily a contraindication to spinal anesthesia. Of course, if the deformity is so marked that spinal puncture cannot be done, it cannot be used. In more than 2500 consecutive cases the author has not failed to effect puncture in a single case. If there is active disease of bone or the overlying soft parts spinal anesthesia should not be used.

In spinal anesthesia a very small dose of a toxic drug is used, and it is confined to a small area in its direct action. The action is temporary and there is no deleterious effect on structures remote from the area of injection. These points, in addition to its particular physiological action, peculiarly adapt it to use in certain conditions in which inhalation anesthesia is contraindicated. The latter is dangerous in these

conditions because it places the organism in a state of general toxicity, because of its irritative action on the lungs, and because of other less important physiological action peculiar to it. In a general way all operations below the level of the nipples can be done with a sufficient degree of success under spinal anesthesia to warrant its use in this selective field, but only in the hands of one with reasonable skill in the method. Facts bearing on physiological action should be the basis for selection in the majority of cases.

Patients in whom there is a very high blood-pressure, or in whom a slight rise in blood-pressure would be dangerous, or in whom it would be advantageous to lower the blood-pressure during operation, should be operated under spinal anesthesia. The majority of patients in this class would probably be those suffering from advanced arteriosclerosis or cardiorenal disease and aneurisms.

There is less impairment of renal function following operation under spinal anesthesia than with inhalation anesthesia. This fact has been definitely determined by a comparative study with the phenolphthalein functional renal test and by careful examination of catheterized specimens of urine before and after operation. This fact renders spinal anesthesia doubly indicated in the presence of nephritis. Although on two occasions severe acute nephritis had developed after a small operation under spinal anesthesia, the sudden renal impairment was due more to trauma and toxic absorption than to any effect of the anesthetic on the kidneys. With ether anesthesia it is more reasonable to admit a direct toxic action on the kidneys. The higher percentage of impairment of excretion as shown by the phthalein test gives reason to this assumption.

In tuberculosis of the lungs, chronic bronchitis, and all other diseases of the respiratory tract except those mentioned under contraindications, spinal anesthesia is preferable to inhalation anesthesia.

Persons suffering from hyperthyroidism can undergo operations on the lower part of the body with spinal anesthesia without danger. The slowing of the pulse seen regularly with stovaine may be somewhat protective. Unfortunately operation for goitre is not safe with this method.

In their series of over 7000 cases no so-called status lymphaticus deaths have occurred. Where this complication could be anticipated spinal anesthesia would probably be preferable.

Spinal anesthesia is a method requiring special training and experience in order that reasonably good results be obtained and safety secured. This is most important in its selective field where cases presenting grave dangers are being handled.

It has a particular field in which it can be considered the anesthetic of choice in many respects.

It has a wider field of applicability in which less satisfactory but reasonably good results can be obtained.

LIQUID PARAFFIN DRESSINGS.

STEWART (*Medical Record*, June 23, 1917) notes that a rectified paraffin acts toward patients and bacteria much as interposed and sterile glass might do. It appears almost neutral to both germs and tissues. It does not become softened and macerated like the watery solutions, nor hardened as does alcohol, nor does it become rancid as do vegetable oils; nor do bandages soaked in it adhere, nor vulnerate on removal.

Three methods are used in bandaging. A couple of yards may be unrolled, cut off, and used to surround the limb after the manner of a sling. The ends of this short piece should be made to cross at the wound, and a pull should be made upon right and left hands at the same time, thus furnishing opposing forces which bring the wound edges together and relieve any strain which might tend to pull them apart. This maneuver may be repeated two or three times, or until the bandage is wound round and round the limb so far as its length will permit. When this is completed a pad or wipe is placed over the seat of the wound, and finally all fastened securely by a roller

The wound should be cleansed, should be filled as full as possible with the paraffin, should be surrounded with cable cord to prevent direct pressure, should be bound with a rather short double-handed bandage, and the whole should be covered and completed in the usual manner.

If paraffin is to be used successfully, the dressings must be adapted to it, the wound must be prepared for it, and these are in addition to the usual teachings of good surgery. After a piece of cable cord (No. 60) has been dropped into a cup or bowlful of liquid paraffin it becomes promptly soaked. This cord is picked out with forceps and adjusted around a wound. Thus the wound cavity is deepened, its capacity for holding the paraffin is increased, yet at the same time the bandage is held off from coming into contact with the wound itself. The patient may be trusted to put upon the outside of an otherwise undisturbed bandage, one-half teaspoonful of the liquid every hour from 8 A.M. to 8 P.M., and one tablespoonful at 10 P.M. No harm can come from its abuse.

After a considerable trial of this simple method it was supplemented by adding one grain of calomel, 6 grains of iodine, and two drachms of ether to 2500 grains of liquid paraffin. The resultant solution looks like one of potassium permanganate. After standing for a few hours it precipitates hydrargyrum biniodide. About two-thirds of the iodine remains in solution, and the supernatant liquid is slightly antiseptic, though not at all irritating to wounds (peritoneum, urethra, etc., as test tissues) nor absorbable by the tissues, in which it is quite different from mixtures that contain animal fats or vegetable oils.

This solution dropped into sinuses causes prompt healing.

The writer states that if he were asked to plan a fool-proof technique for the laity or for first-aiders he would recommend this as standing the test of manipulation by ignorant and dirty fingers: Make a solution of one heaping teaspoonful of bicarbonate of soda, or of washing soda, or of hard brown laundry soap, to one quart and a half of water. Boil hard for ten full minutes. Put in a fountain syringe and irrigate the wound thoroughly, using a medicine dropper for a nozzle. After running the whole quantity through and over the wound apply the liquid paraffin and bandage.

TREATMENT OF PELVIC INFLAMMATORY LESIONS.

CLARK and NORRIS (*Surgery, Gynecology and Obstetrics,* July, 1917) from a study of the subject reach the following conclusions:

In more than 500 cases in which the postoperative and remote results of surgical intervention in pyogenic infections in the Fallopian tubes were considered, they conclude that a course of conservative preparatory treatment decreases mortality, and enhances the chances for securing a good functional restoration of the pelvic organs.

In all cases of acute infections of the Fallopian tubes, the patient should be kept under observation until the course of the case is defined. (*a*) In the greatest majority the temperature subsides, the pain disappears, the tubal enlargements decrease to impalpable proportions, and if the attack is a primary one the patient may be given a respite from operation until a recurrent attack supervenes. Even under these recurrent conditions the conservative policy is again pursued until subsidence takes place a second time, when an abdominal operation is advised, with a view to treating existing conditions to the best possible advantage. Usually both tubes are removed and the ovaries are conserved. (*b*) If under the conservative plan the symptoms do not abate and the tube continues to enlarge, vaginal drainage is instituted, either by direct incision into the cul-de-sac or through the guidance of an abdominal incision.

In the purulent lesions of the tube, all operative procedures are attended with a higher mortality and a greater morbidity, whereas under a conservative waiting treat-

ment a patient will seldom die during an acute infection. In the upper series there was no death. In all hazardous cases the increasing severity of the symptoms and the enlargement of pelvic mases give ample warning, and permit of a simple drainage operation that will tide the patient over the danger.

When the acute attack has subsided the surgeon has the best opportunity for ascertaining, during the course of an operation, the exact degree of involvement of the tissues, and thus he is enabled to select the type of operation best suited to the individual patient.

Conservative operative procedures instituted with a view to restoring a closed Fallopian tube seldom restore fecundity. Plastic operations upon the fimbriated extremities of the Fallopian tubes, with a view to effecting restoration of fecundity, are almost invariably failures, and necessitate additional operations. The authors believe, therefore, that the safer policy usually is to remove the tubes by a wedge-shaped cornual excision in all doubtful cases, thus disregarding any attempt at restoration of fecundity.

Hysterosalpingo-oöphorectomy in sexually mature women, the subjects of chronic infections of the uterus and adnexa, is followed by a lower mortality and a greater certainty of restoration to health than are possible after conservative operations.

Conservative operations employed with a view to preserving ovarian tissue should be limited chiefly to women under thirty years of age.

The routine drainage of pus-tubes through an abdominal incision is an unsatisfactory procedure from every standpoint, and should not be resorted to if it can possibly be avoided.

REVIEWS.

THE DIAGNOSTICS AND TREATMENT OF TROPICAL DISEASES. By E. R. Stitt, A.B., Ph.G., M.D. Second Edition, Revised and Enlarged. Illustrated. P. Blakiston's Son & Co., Philadelphia, 1917. Price $2.00.

Dr. Stitt, for the Medical Corps of the Navy, and Dr. Craig, for the Medical Corps of the Army, have not only done exceedingly creditable work in the investigation of tropical diseases, but have laid the whole medical profession under obligation to them for advancing medical knowledge and bringing the American medical profession before the profession of the world as being in the vanguard of scientific investigation.

Dr. Stitt's opportunities for studying tropical diseases have been world-wide, and it will be recalled that he has also written a most excellent book upon Practical Bacteriology, Blood Work, and Animal Parasitology, which is now in its fourth edition.

Every year increases the opportunity of American medical men becoming thoroughly familiar with tropical diseases, since the constant extension of American influence in tropical and subtropical areas is not only bringing more and more tropical diseases to our shores, but is also sending many medical men far afield in the practice of their profession.

The copious illustrations found in this volume are a very material addition to the text. The earlier edition took a commanding position in the literature of this subject, and the present edition will materially increase the reputation of the author and still further popularize any contributions which he may make to the subjects in which he is recognized as an authority.

In the present edition two new chapters have been added to the section on the diagnostics of tropical diseases. One of these deals with special problems attaching to diagnosis in the tropics with a brief discussion of the peculiarities and frequency of cosmopolitan diseases in these areas, and the other deals with the diagnostic value of

clinical manifestations from the side of the cutaneous system and the organs of the special senses. Matter which is of sufficient importance to be included, but which is not of first-grade importance, is printed in small type in order to save space.

MALINGERING OR THE SIMULATION OF DISEASE. By A. Bassett Jones, M.D., and Llewellyn J. Llewellyn, M.D. With a chapter on Malingering in Relation to the Eye, by W. M. Beaumont. P. Blakiston's Son & Company, Philadelphia, 1917. Price $7.00.

This is quite an exhaustive work upon a subject which at the present time is of greater importance all over the world than ever before. First, because the introduction of the plan of workmen's compensation tempts malingerers, and second, because the multitude that are being taken for military service also increases the number of persons who desire to misrepresent their condition, or to present symptoms or lesions seemingly so grave that they may be exempted from military duty.

As the author points out, the study of malingering has not received the attention from the general medical profession that it deserves. If it received more attention it is probable that an accurate diagnosis in ordinary practice would be made with greater frequency, for sometimes functional and organic disease, directly or indirectly, produces a mental state which makes a patient a conscious or an unconscious malingerer in the sense that he describes symptoms that he does not have, or is firmly convinced that actual lesions are present in his body, when, as a matter of fact, they are solely in his imagination. Many of these patients deserve sympathy, not only because of the underlying pathological state but still more because of the mental state which has been engendered; nevertheless, to relieve both the physical and mental state is the function of the physician, and this relief cannot be obtained until he has made an accurate diagnosis along both lines.

In the present book there are no less than thirty-three chapters, divided into five sections. Beginning with a historical introduction and discussing the etiology of malingering, the authors deal with the influence of recent legislation, the psychology of malingering, its diagnosis, and the formation of a decision on the part of the examiner. In section two malingering in relation to the nervous system is considered in no less than fifteen chapters, thereby forming, as we would naturally expect, the greater portion of the volume. In section three malingering in relation to internal disease is considered, and in section four malingering in relation to accident is discussed. Section five deals with measures for the restriction of malingering.

In one sense this book may be said to be one dealing with diagnosis, for practically every chapter contains careful descriptions of methods of examination, psychical and physical, for the purpose of uncovering the fictitious or real conditions which are present. The book is one which will be of great interest to all medical men, and particularly to those who have to deal with the subject of recruiting or workmen's compensation. There are a number of plates introduced to make the text more clear. We regret that more illustrations of some of the external conditions described are not included.

The book is well printed, reveals an intimate knowledge of the subject, and will undoubtedly prove to be the standard work on this subject for a long time to come.

DISEASES OF THE CHEST AND THE PRINCIPLES OF PHYSICAL DIAGNOSIS. By George William Norris, A.B., M.D., and H. R. M. Landis, A.B., M.D. With a chapter upon The Electrocardiograph in Heart Disease by Edward B. Krumbhaar, Ph.D., M.D. Illustrated. W. B. Saunders Company, Philadelphia, 1917. Price $7.00.

It is not often that a book appears written by two authors. When it does appear and both authors are responsible for all the text there is such conflict of opinion, or such lack of character in the text, that the book is spoiled. This is avoided in the present instance by Dr. Norris devoting himself to the physical examination of the lungs and the circulatory system, whereby some two hundred and fifty pages of the book are covered, while Dr. Landis writes upon diseases of the bronchi, lungs, pleura

and diaphragm, and diseases of the pericardium, heart, and aorta. As the volume contains nearly eight hundred pages it is readily seen that Dr. Landis contributes the greater part of the text. The illustrations are excellent, and we are sorry that the opening pages of the book do not contain an index of them—that is, a list of illustrations. Most of them, of course, are black and white, but there are plates in color. Dr. Landis, as director of the clinical department of the Henry Phipps Institute for Tuberculosis, has had very large opportunities for the study of thoracic conditions, and the pathological material which he has had for study has been plentiful. The scope of the book is very well defined in its title, but such a title might precede text of mediocre value. We have gone over the text, however, with more than usual care, and have arrived at the conclusion that the authors, particularly Dr. Landis because of the wide scope of his subject, have made a very noteworthy contribution to our knowledge of diseases of the chest.

It is refreshing to read a book which is not merely a restatement of facts already known, but one which joins to such facts the results of original investigations, and ideas, by men who have devoted a very considerable period of time to the study of their subject and an immense amount of labor to the compilation of their volume.

A Manual of Personal Hygiene. By American Authors. Edited by Walter L. Pyle, A.M., M.D. Seventh Edition, Revised and Enlarged. W. B. Saunders Company, Philadelphia, 1917.

Ten contributors have prepared the text for this volume of a little over five hundred and fifty pages. Its object is to present a plan for proper living upon a physiological basis. In other words, to set forth plainly the best means of developing and maintaining physical and mental vigor. The first edition appeared seventeen years ago, and the present edition does not very materially differ from the sixth, except to contain some new paragraphs of timely interest. The book, of course, is intended more for lay reading than for the graduate in medicine, but, after all, it is a noteworthy fact that the graduate of medicine, however clever he may be in taking care of other people, is known to be extraordinarily lacking in his ability to take care of himself and in carrying out hygienic methods of living which would inure to his own advantage. Practitioners, old and young, therefore, will learn much from this book which will not only be advantageous to their patients, but to themselves, and, unlike many volumes of this character, it can be placed in the hands of patients without the fear that as a result they will obtain a host of mutilated or distorted ideas in regard to the physiological processes in their bodies. It is perhaps the best effort at presenting medical facts in a readable form for the lay mind that has yet appeared.

Nutrition and Clinical Dietetics. By Herbert S. Carter, M.A., M.D., Paul E. Howe, M.A., Ph.D., and Howard H. Mason, A.B., M.D. Lea & Febiger, Philadelphia, 1917. Price $5.50.

Within the last ten years, as we have pointed out within the last few months in the review of another book dealing with dietetics, a very considerable number of contributions to the literature of this subject have appeared. Some of them have been elementary and some of them scientific and exhaustive. The present book aims to be in the latter class, as it contains about six hundred and fifty pages. Part I deals with foods and normal nutrition in general terms; Part II with individual foods; Part III with feeding in infancy and childhood; and Part IV with feeding in disease. Naturally, this portion of the volume takes up the greatest space, extending from page 271 to page 600. The book is very well printed on excellent paper and easy to read.

Unlike many other volumes which are the work of three authors, it is not uneven in quality. Dr. Carter writes as a medical clinician, Dr. Howe as a biological chemist, and Dr. Mason as a pediatrist. There can be no doubt that in the practice of many medical men too little attention is paid to diet, while, on the other hand, in some cases too rigid rules are prescribed, the physician seeming to fail to recognize that the body

has wonderful powers of adjusting itself to its nutritional needs.

The present volume is a practical, clinical statement of modern knowledge in regard to food values expressed in such a way as to be more useful to the practitioner than to the physiological chemist.

PROGRESSIVE MEDICINE. A Quarterly Digest of Advances, Discoveries, and Improvements in the Medical and Surgical Sciences. Edited by Hobart A. Hare, M.D., Assisted by Leighton F. Appleman, M.D. Volume Three, September, 1917.

As in previous years, the present volume contains an article by Dr. Ewart, of London, upon Diseases of the Thorax and its Viscera, Including the Heart, Lungs and Blood Vessels; another upon Dermatology and Syphilis by Dr. Gottheil, of New York; the third important clinical article is by Dr. Davis, of Philadelphia, on Obstetrics; and the fourth on Diseases of the Nervous System, by Dr. Spiller, of Philadelphia.

The design of Progressive Medicine is to afford a story, or narrative, of medical and surgical advances for the last twelve months. That it does so would seem to be shown by the fact that not only has it proved of use in civil life, but that its usefulness has been favorably noted by those who are using it while engaged in active service in France at the present time.

A TEXT-BOOK OF MATERIA MEDICA FOR NURSES, INCLUDING THERAPEUTICS AND TOXICOLOGY. By George P. Paul, M.D. Third Edition, Thoroughly Revised. W. B. Saunders Company, Philadelphia, 1917. Price $1.50.

When an author writes a book with this title and attempts in less than three hundred pages, including the index, to cover materia medica, therapeutics, and toxicology, he is forced to resort to an amount of concentration which is difficult of accomplishment, and the question at once arises as to whether he has been able to introduce much of any of these important subjects. Of course, it is not expected that the volume will be exhaustive. Some of the statements, necessarily dogmatic, give questionable information. Thus we are told that acetanilid is a cardiac depressant, but that, unlike antipyrin, it produces a stronger pulse. Probably the author intended to state that it does not depress the pulse as much as antipyrin. Furthermore the statement that acetanilid is used as an antipyretic in tuberculosis hardly gives a correct conception of its proper employment, since this is a type of fever in which it nearly always does harm. Under ammonia we are told that spinal activity is augmented and convulsions may be brought about, which we think gives an erroneous impression as to the possible results of the use of this medicament, and the statement that neosalvarsan, which "differs a trifle from salvarsan, is as efficient as the latter drug, but is said not to be so toxic," hardly represents the facts as the profession believe them to be to-day.

HANDBOOK OF ANATOMY. By James K. Young, M.D., F.A.C.S. Fifth Edition, Revised and Enlarged. Illustrated. F. A. Davis Company, Philadelphia and London, 1917.

This well-illustrated compend, clear in its text, logical in arrangement, represents an excellent text-book for students, and is a most useful reference book to the practitioner who wishes to become quickly informed of anatomical points which have escaped his memory.

The Basle nomenclature has been incorporated. A special chapter comprising Anatomy of the Face, Teeth and Jaws has been prepared by Joseph L. Appleton. The book opens with an admirably condensed osteology; thereafter in sequence Articulations and Ligaments, The Muscular System, The Heart and Vascular System, The Alimentary Apparatus, Vocal and Respiratory Apparatus, The Genito-urinary Apparatus, The Nervous System, Organs of Special Sense, Surgical Anatomy, Dental Anatomy.

A MANUAL OF ANATOMY. By Henry Erdmann Radasch, M.Sc., M.D. Illustrated. W. B. Saunders Co., Philadelphia and London, 1917. Price, cloth, $3.50 net.

This excellent book, made up in Saunders' best method, with illustrations distinctly helpful to the text, some of them of very high quality, sets forth in such form as is best calculated to enable the student

to formulate and systematize his knowledge, the essential facts of anatomy. As to the nervous system, the various pathways are taken up and given separate and rather full consideration, so that impulses may be traced, in a connected manner, from origin to termination. The semilunar valves of the aorta and pulmonary artery are described with their respective vessels. Moreover the Basle nomenclature is used throughout. Credit is given for illustrations, to which the compliment of borrowing has been accorded; there are some excellent pictures from specimens in the Daniel Baugh Institute of Anatomy. This is an excellent text-book for the student and a ready reference book for the practitioner.

HANDBOOK OF GYNECOLOGY. By Henry Foster Lewis, A.B., M.D., and Alfred De Roulet, B.Sc., M.S., M.D. Illustrated. C. V. Mosby, St. Louis, 1917.

This book was prepared to meet the needs of third- and fourth-year medical students and the young practitioner who has not yet settled on a special field and justly bases whatever claim it has to recognition or acceptance and use upon its even balance in regard to the space and accentuation given to the various topics discussed in relation to their relative importance. There is a somewhat original and distinctly serviceable classification based upon teaching experience. After chapters devoted to Anatomy, Physiology, Diagnostic Methods, Asepsis and Gynecology, The Care of the Patient Before and After Operation receives particular attention. Thereafter follow sections on Anæsthesia, Anomalies of the Female Genitals, Uterine Displacements, Injuries of the Female Genitals, Gynecological Hernia, Infection of the Female Genitals, Neoplasms, Ectopic Gestation, Symptomatic Disorders, and Neuroses and Psychoses.

The illustrations are excellent and helpful. The directions throughout are those accepted as standard by most clinics. The reader is not confused by a multiplicity of methods, and the work is admirably adapted for the class for whom it has been written.

THE PRACTICAL MEDICINE SERIES. Under the General Editorial Charge of Charles L. Mix, A.M., M.D. Volume II, General Surgery. Edited by Albert J. Ochsner, M.D., F.R.M.S., LL.D., F.A.C.S. Series 1917. The Year Book Publishers, Chicago. Price $2.

In the introduction to this volume Ochsner pays a beautiful and well-deserved tribute to Murphy, the surgeon, marked by the appreciation of a fellow technician and the affection of a close personal friend.

Ochsner has gathered from current literature, with that ripe judgment so preeminently possessed by him, the best and most serviceable, and sets it forth in a clear fashion. Under the caption Analgesia he is opposed to nitrous oxide and in favor of ether by the drop method. Allen's excellent study on Analgesia and its rather sharp localization is considered.

The Treatment of Infected Wounds includes the light method, saline solution, Dakin's fluid, colloidal gold, soap, and a number of other antiseptics. The treatment by light is considered favorably. There is a section, and a most interesting one, upon Operative Technic. It includes War Surgery.